Form 2 r. 19))

Application Reference No:.....

For official use

THE ENVIRONMENT MANAGEMENT AND CO-ORDINATION ACT

SUBMISSION OF ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT

Part A: DETAILS OF PROPONENT

A1 Name of proponent (Person or Firm): HAZE CONNECT LTD

A2 PIN No: P051609117F

A3 Address P.O BOX 81737- MOMBASA

A4 Name of contact: MESHACK KURGAT

A5 Telephone No. +254 0724579577

Part B: DETAILS OF THE ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT

B1 Title of the proposed project

ESIK Study report for the proposed asbestos disposal (Landfill site on plot LR No: 8852 Nzambaraini area Mtwapa Sub County Kilifi County)

B2 Objectives and scope of the project

Operation of asbestos, Management, Handling and Disposal

B3 Description of the activities

Erecting temporary site office, sanitary block with toilets, temporary storage area, excavation and construction of prb/cell during operation. Provision of safety gears appropriate for disposal, provision of security services. Proposed site is a bare field covered shrubs.

B4 Location of the proposed project

Nzambaraini Area, Mtwapa Subcounty, Kilifi County.

Part C: DECLATION BY THE PROPONENT

I hereby certify that the particulars given above are correct and true to the best of my knowledge.

Name:...Meshack Kurgat **SIGN.....**

HAZE CONNECT LTD.

P. O. Box 81737

Date……14/03/2025……

Part D: DETAILS OF ENVIRONMETAL IMPACT ASSESSMENT EXPERT

Name (individual/firm) Prof. Joseph Tunje

Certificate of registration No. 1290

Address. P.O BOX 3807 -80108 Kilifi.

Tel: + 254 720110382

Signature……Date…14/03/2025……

Part E: OFFICIAL USE

Approved / not approved:……

Comments:……

Officer……Sign……Date……

Important Notes: Please submit the following:

(a) Three copies of this form
(b) 10 copies of the project study report
(c) the prescribed fees, to:

Director-General,
The National Environment Management Authority,
popo Road, South C,
P.O. Box 47146,
NAIROBI.
Tel. 254-02-6009013/27/79 or 6008999 Fax. 254-02-6008997 E-mail dgnema@nema.go.ke

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY REPORT FOR THE PROPOSED ASBESTOS DISPOSAL (LANDFILL) SITE ON PLOT L.R. No. 8852 MZAMBARAUNI AREA, MTWAPA SUB-COUNTY, IN KILIFI COUNTY.

PROPONENT

HAZE CONNECT LIMITED
P.O. BOX 42550 – 10100
NAIROBI, KENYA

GPS CO-ORDINATES:

GPS Coordinates -3.930411, 39.752184

EIA TEAM LEADER:
PROF. JOSEPH TUNJE
LEAD EIA/AUDIT EXPERT REG. No. 1290
P.O Box 195-80105
NAIROBI

March 2025

CERTIFICATION

Certification by EIA Expert

I certify that this Environmental Impact Assessment study report has been done under our supervision and that all due diligence has been taken in assessment criteria, methodology and report writing and that it conforms to the requirements of the Environmental Management and Coordination Act, 1999 and Legal Notice No. 101 of June 2003 (Environmental Impact Assessment and Audit Regulations).

EIA Expert;

Prof Joseph Tunje – Lead Expert (1290)

Signature: _____ Signature: _____

Date: _____

Alice Abuyah – Associate Expert (9931)

Signature: _____ Signature: _____

Date: _____

Calvin Ogembo – Associate Expert (12242)

Signature: _____ Signature: _____

Date: _____

Stephen Owour – Hydrologist (WD/WP/208)

Signature: _____ Signature: _____

Date: _____

Certification by Proponent

HAZE CONNECT LIMITED

I, …… confirm that the content of this EIA study report is true to the best of my knowledge and it has been submitted to NEMA with my approval as the proponent.

Designation: _____ **Signature:** _____

Date: _____

PROPONENT ADDRESS:

HAZE CONNECT LIMITED
P.O. BOX 42550 – 80100
NAIROBI, KENYA

EXECUTIVE SUMMARY

Environmental Impact Assessment study report is a planning tool now generally accepted as an integral component of sound decision-making. The purpose of Environmental Impact Assessment is to give the environment its due place in the decision-making process by clearly evaluating the environmental consequences of the proposed activity before action is taken. Early identification and characterization of critical environmental impacts allows the public and the government to form a view about the environmental acceptability of a proposed developmental project and what conditions should apply to mitigate or reduce those risks and impacts. Following concern arising from the presence of asbestos wastes generated in various asbestos containing materials, building and construction sectors, the company commissioned a study to assess and identify the appropriate site where these materials can be disposed-off safely. The study was to identify the impacts of such disposal within the premises and to make recommendations thereon. The study has made a series of recommendations regarding handling and disposal among others. As legislative requirements provide for the preparation of an Environmental Impact Assessment for projects that might have adverse effects upon the environment, the proposed project is being subjected to the statutory EIA process.

HAZE CONNECT LIMITED, a Kenyan registered company with Memorandum of Association incorporated in Kenya to operate various business entities has a vested interest in operation of Asbestos Management, Handling and Disposal project the land is registered in the name of the proponent, HAZE CONNECT LIMITED management have purchased the parcel of land which is estimated to be 20 acres and from the 20 acres piece of land, the proponent intends to utilize 5 acres for asbestos disposal site. HAZE CONNECT LIMITED proposes to provide a facility that will offer solutions to asbestos disposal from various building that intend to dispose of the asbestos roofing's and any other asbestos containing materials within republic of Kenya.

Asbestos is a Group of six different fibrous minerals (amosite, chrysotile, crocidolite, and the fibrous varieties of tremolite, actinolite, and anthophyllite) that occur naturally in the environment. All forms of asbestos are hazardous, and all can cause cancer.

Asbestos years back was lauded for its versatility, recognized for its heat resistance, tensile strength and insulating properties, and used for everything from fire-proof vests to home and commercial construction. It was woven into fabric, and mixed with cement.

Its properties were so desired that the United States military mandated its use in every branch of service. Asbestos was a perfect blend to make things better – except it was highly toxic, too. Today asbestos is a known cause of mesothelioma cancer, thus is banned in more than 50 countries and its use has been dramatically restricted in others.

The major components of this project will be erecting of a temporary site office; sanitary block with toilets, shower room and changing room; truck washing bay; chain link fence/perimeter wall to cover the selected area for disposal of asbestos; temporary storage areas; excavations and construction of pits/cells. Pits will be dug to a depth of approximately 10 metres then lined with concrete. During operation phase, there will be provision of safety gears that are appropriate for asbestos disposal and provision of security services at the site to prevent trespassing to site. The project cost is estimated to be Ksh.15 million and this is for fencing of site, construction cells and support facilities within the site. The proposed disposal site is in a bare field covered with shrubs. The area is sparsely populated

In view of its anticipated environmental impacts, an environmental Impact assessment was carried out to enhance project acceptability and identify measures aimed at mitigating the negative impacts. The full EIA followed an earlier scoping exercise that identified the significant impacts. The assessment used site surveys and a checklist among other tools. This report highlights the main features of the project and the procedural context, within which the EIA was prepared, and discusses some of the main issues that need to be addressed to improve the project's area and the surrounding.

The terms of reference for the preparation of the EIA Report are:

- A critical look into project objectives
- The proposed location of the project site
- Description of project objectives.
- A concise description the national environmental legislative and regulatory framework, and any other relevant information related to the project
- Evaluation of the technology, procedures and processes to be used in the implementation of the project
- Description, evaluation and analysis of the foreseeable potential environmental effects of the project broadly classified into physical, ecological/biological and socio-economic

aspects which can be classified as direct, indirect, cumulative, irreversible, short-term and long-term effects.

- Evaluation and analysis of alternatives including the proposed project, project alternative, project site, design and technologies
- An Environmental Management Plan (EMP), proposing the measures for eliminating/minimizing or mitigating adverse impacts on the environment,
- Propose measures to prevent health and safety hazards and to ensure security in the working environment for the employees, and for the management in case of emergencies. This encompasses prevention and management of the foreseeable accidents and hazards during operational phase.

SUMMARY EMP FOR CONSTRUCTION AND OPERATION

IMPACTS	**Mitigation measures**
Excavations and protection of flora and fauna	• Protect as possible indigenous trees and other surrounding vegetation that need not be removed. Minimize site clearance to only areas needed for excavations • Undertake continuous excavation of asbestos pits/cells. That is excavation of any subsequent pit shall base on expected asbestos materials • Plant trees around the perimeter fence and within some section of the site • Cover any asbestos pit that is not full with polythene sheet and soil 1m above the buried asbestos and seal the cell with concrete material as it awaits more asbestos materials to be concluded as full.
Safety & health	• Occupational Safety and Health Act, 2007 • Training the workers on the potential health risk caused by exposure to asbestos and how to reduce these risks • The asbestos removal and disposal workers shall be trained on safe asbestos handling techniques. • Notify workers about the upcoming disposal activity and the Safety requirements • Prepare appropriate PPE • PPEs shall be of single use and shall be used once and disposed with asbestos materials • Post appropriate signpost of the site that will inform the workers of key rules to follow • Put in place an appropriate emergency and incident response plan

Waste Generation	• Train cleaning and maintenance workers on the need for proper waste management • Minimize waste generation, segregate general and hazardous waste in color coded refuse bins. • Any waste/material contaminated with asbestos shall out rightly be disposed of in asbestos pit
Asbestos management	• The onsite and offsite Asbestos disposal site shall be marked clearly as asbestos hazard area in accordance with the National Guidelines on Safe Management and Disposal of Asbestos • The asbestos will be appropriately contained and sealed to minimize exposure • The asbestos prior to removal shall be treated with a wetting agent to minimize asbestos dust • Asbestos shall be handled and disposed by skilled & experienced professionals • If asbestos material is being stored temporarily, the wastes shall be securely enclosed inside closed containments, marked appropriately and secured. • The removed asbestos will not be reused or recycled in anyway • The asbestos materials removed shall be buried onsite/offsite based on the client's preference • Removal including Onsite/offsite disposal of asbestos shall be subjected to environmental impact assessment in accordance with the Environmental (Impact Assessment and Audit) Regulations, 2003.
Management of temporary waste storage sites	• Ensure management of temporary waste storage sites is in line with the National Guidelines on Safe Management and Disposal of Asbestos. • Register and monitor waste volumes at the temporary waste storage site • Oversee the physical removal of the waste from the temporary waste storage sites
Traffic and Pedestrian Safety	• Signposting, warning signs, barriers and traffic diversions: site should be clearly visible and the workers warned of all potential hazards • Provision of safe passages and crossings for pedestrians be made • Train staff at the site on safe and convenient passage at the work place. • Ensuring safe and continuous access to office facilities, shops and residences during disposal and cleaning activities, if the facility is in operation during this activity
Air Quality	• Establish simple air quality monitoring that ensures the outputs of the monitoring process are maintained and utilized in improving. • Appoint a dust monitoring agent/lab to monitor and analyze dust and air quality • Air monitoring should be done continuously in areas related to asbestos removal works.

Storm water Management	Ensure all storm water from the site is directed towards the established water drains
Hygiene and sanitary provision	Provide washrooms, bathrooms and changing rooms within the facility Provide truck was bay for cleaning asbestos transportation vehicles
Disposal Scheduling and Hours	The disposal and cleaning activities should be limited from 7 am or sunrise (whichever is later) to 5 pm or sunset
Clearance Inspections	Inspections should be done to ensure that temporary storage site and work environment is cleaned to a satisfaction standard.

There is increased awareness on health impacts of deteriorating asbestos roofing sheets and this has led to increased projects for removal of the asbestos roofing sheets for disposal and replacing them with galvanized roofing sheets. Research shows that undisturbed asbestos roofs in good condition typically do not pose a health risk if the asbestos fibres remain bound in solid cement. Asbestos roof sheets become more of a hazard over time, becoming brittle and deteriorating with exposure to the sun and rain. The asbestos fibres may become airborne and dangerous. The more weathered the roof becomes, the more significant the health risk.

This surge of projects of removal of asbestos roofing sheets have led to demand for proper disposal of the asbestos roofing sheets. It is for this reason that HAZE CONNECT LIMITED is in the process of setting up a facility that will ensure safe disposal of asbestos containing materials mostly asbestos roofing sheets thus solving issue of poor disposal of the asbestos where some reuse or dispose haphazardly.

In view of its anticipated environmental impacts, an environmental Impact assessment study report was prepared to enhance project acceptability and identify measures aimed at mitigating the negative impacts. The EIA study followed an earlier scoping exercise that identified the significant impacts. The assessment used site surveys, a checklist interview of locals among other tools. In addition, public consultation was done through a public forum (*baraza*) chaired by the area Chief. This report highlights the main features of the project and the procedural context, within which the EIA was prepared, and discusses anticipated impacts and proposes mitigation measures to the anticipated impacts.

ABBREVIATIONS

NEAP	National Environnent Action Plan
EIA	Environmental Impact Assessment
LTD	Limited
NEMA	National Environment Management Authority
EMCA	Environmental Management and Co-Ordination Act
OEL	Operational Exposure Limit
EMP	Environmental Management Plan

Table of Contents

1.0. INTRODUCTION

Environmental Impact Assessment is a planning tool now generally accepted as an integral component of sound decision-making. The purpose of Environmental Impact Assessment is to give the environment its due place in the decision-making process by clearly evaluating the environmental consequences of the proposed activity before action is taken. Early identification and characterization of critical environmental impacts allows the public and the government to form a view about the environmental acceptability of a proposed developmental project and what conditions should apply to mitigate or reduce those risks and impacts.

This Environmental Impact Assessment (EIA) is to provide information on the potential negative and positive environmental and social impacts of the proposed asbestos disposal site on L.R. No. 8852 MZAMBARAUNI AREA, MTWAPA SUB-COUNTY, IN KILIFI COUNTY. It also aims to make recommendations for the mitigation of the potential negative impacts and enhancement of the positive ones. A field survey of the project site was conducted and potential environmental impacts of project activities were identified, assessed, and documented. The EIA Team carried out consultations with various stakeholders, particularly lead agencies, local authorities and the affected people.

Following concern arising from the presence of roofing asbestos within the county and republic of Kenya. HAZE CONNECT LIMITED commissioned a study to assess and identify the appropriate site where these materials can be disposed off safely. The study was to identify the impacts of such disposal and to make recommendations thereon. The study has made a series of recommendations regarding handling and disposal among others.

As legislative requirements provide for the preparation of an Environmental Impact Assessment for projects that might have adverse effects upon the environment, the proposed project is being subjected to the statutory EIA process. Pursuant to section 58 of the Environmental Management and Coordination Act, (EMCA) 1999, the National Environment Management Authority (NEMA) requires project proponents to carry out Environmental Impact Assessments (EIA) and prepare related reports for developments that have the potential of resulting to negative social and environmental impacts. The proposed project falls under category 2-High Risk Projects (12) Waste Disposal (k) Commercial asbestos disposal sites. It is for this reason as required by The

Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019 that an EIA study done for submission to NEMA for consideration of approval.

1.1. DESCRIPTION OF THE PROJECT

HAZE CONNECT LIMITED herein referred to as the proponent proposes to establish a commercial asbestos disposal site on L.R. No. 8852 MZAMBARAUNI AREA, MTWAPA SUB-COUNTY, IN KILIFI COUNTY. The parcel of land is approximately 20 Acres size but the proponent intends to utilize ten acres for the disposal activities. The proposed project involves construction of asbestos pits, temporary storage area, site office, sanitary block (toilets, shower room and changing room), truck washing bay, perimeter wall/fence and associate amenities. The proponent intends to venture into the business of asbestos removal & offsite disposal services. The site shall be fenced off to limit any access to unauthorized persons. The site is not for a one-off disposal but rather a site that will be used as a commercial disposal site for potential clients who wants to dispose-off their asbestos waste therefore the size/tons of asbestos to be disposed-off annually cannot be determined yet.

Proposed site having been identified ideal, shall only be commissioned once the license for operations has been issued. Once a potential client contracts the company (Legacy La Relance (EA) Ltd), the management will calculate the space that might be required for disposal of asbestos waste depending on the asbestos waste quantity available. Thereafter the proponent will excavate the space for that specific disposal up to a ***depth of 10 Metres*** below the ground but strictly guided by the hydrogeological survey report by a qualified and registered hydrologist to guide on depth. A concrete wall/lining will then be constructed on the excavated pit to ensure that the asbestos waste leachate does not go into the underground water sources or alternatively a polythene liner can be used if the wall characteristics permit. The asbestos waste shall be placed on the pit to up to 1m below ground level then covered appropriately. The proponent will then ensure that the pits are well marked indicating what has been disposed and the warning sign indicating ‘Danger’.

The proposed project will contribute towards sustainable waste management, employment creation and income generation both during construction and operation phases thereby improving the living standards, project consultants and the project proponent.

The proponent shall specialize in removal, transportation as well as **disposal** of asbestos materials. This will majorly involve

Item	Activity
1.	• The proponent shall advise all its **offsite and onsite clients** on environmental requirements such as the need for EIA, hydrogeological survey report and risk analysis where applicable. • Hydrogeological analysis (of the proposed-on site/offsite landfill) to determine its suitability for asbestos disposal without contaminating the underground water to be included in the EIA report. Done by a qualified hydrologist • The proposed **OFFSITE DISPOSAL** has been subjected to hydrogeological survey analysis, report appended herein so the offsite disposal will only be subjected to EIA and Risk assessment and they shall have dully executed contract for disposal of asbestos materials with our company. • Risk assessment for removal and disposal of asbestos shall always be done by a DOSHS licensed Occupational Safety and Health (OSH) advisor and a NEMA registered environmental Expert.
2.	Removal and transportation to **the onsite pit** or **licensed offsite** landfill involves; a. Procurement of Personal Protective Equipment's (PPEs) and; b. Heavy gauge Asbestos plastic wrapping liners and pit plastic liners c. Notification of affected parties on the time and nature of work to be done d. Training of workforce on safe work procedure e. Fully trained technical and casual staff all equipped with recommended PPEs f. Removal tools g. Double wrapping of bundled asbestos roofing sheets with 500 gauged lined plastic sheet h. Securing the temporal holding area for asbestos before actual disposal which should not be more than 30 days if offsite. i. Transportation of asbestos to the on-site disposal pit/licensed offsite landfill using a NEMA licensed vehicle j. Excavation of the pit to a depth recommended in the hydrological report and shall follow NEMA guidelines on safe handling and disposal of Asbestos. k. Covering the pit with liner l. Gently lowering the stacked asbestos materials to the prepared pit m. Covering the pit with a plastic liner and soil 1m below the ground level n. Securing the pit with chain link and labeling as "asbestos hazard area keep out"

Note that the proponent shall undertake **onsite** and **offsite** asbestos disposal based on the **PREFERENCE OF THE CLIENT** and in accordance with the existing local bylaws and legal requirements. **The main reference in this context is on the compliance to EMC (Waste Management) Regulations, 2006 and in line with the National Guidelines on Safe Management and Disposal of Asbestos, 2013**

1.2.1 Disposal procedures for asbestos

Asbestos waste must be disposed of at approved NEMA sites. It must not be sold or re-used. The proponent shall ensure a standard operating procedure for Asbestos handling and disposal and the same shall be oriented to all employees and clients.

Handling and disposing of asbestos include:

- ***Planning the project appropriately:*** assess the size and severity of the asbestos removal and disposal project. A licensed asbestos handler must prepare an asbestos removal control plan for any licensed asbestos removal work being undertaken.

  The removal control plan must include details of the means of transport and disposal of asbestos waste. The removal control plan must include details of the means of transport and disposal of asbestos waste.

  An asbestos removal control plan shall describe:

  - How the waste is contained (on and off site)
  - The quantity (amount and dimensions) of waste
  - Where the waste will be stored on site before disposal
  - How the waste will be transported (on and off site)
  - Approvals from the local authority
  - Local authority requirements such as quantity of asbestos and dimensions of containers
  - Where the waste will be transported to
  - Verification of correct disposal such as tip dockets.

The asbestos removal plan must be kept on site.

- **Preparing the work area:** The work area must be sealed off to prevent contamination outside the work area. Surfaces near the work area must be covered in plastic sheeting. Warning signs must be posted to alert others that the asbestos project is underway.
- **Wearing personal safety protection:** Workers must wear an N-100 or P-100 respirator and protective clothing to prevent asbestos exposure.
- **Safety protocols in the work area:** Heating, ventilation and air conditioning (HVAC) systems must be disabled to prevent circulation of asbestos fibers. A HEPA vacuum to be used to clean asbestos off immoveable objects to control dust and the clean-up should be after work is finished daily until the day of project completion. Decontamination units to be provided so as to allow workers remove contaminated clothing, shoes and tools. It should have showers.
- **How to handle and dispose-off asbestos waste:** Asbestos Containing Materials (ACM) should be wetted prior to any removal. Workers must wear appropriate personal safety protection (respirator and protective clothing) as they work with contaminated materials. All asbestos waste generated during the project should be wetted before being double-bagged in 6mm plastic bag. The wastes are temporarily stored at designated area within the project site awaiting disposal to an ACM waste licensed landfill.
- ***Transportation of asbestos waste to disposal site:*** A NEMA licensed vehicle shall be used to transport asbestos waste from project area to disposal site. The waste shall be carefully loaded and offloaded to prevent breakages and rapture of plastic bags.

The asbestos removal plan shall be kept on site.

Asbestos waste storage on site prior to removal

Before being removed from site, asbestos waste must be stored in closed containers that are impermeable to asbestos dust, such as 500-gauge thick plastic bags or double wrapped in 500-gauge thick polythene sheet

Asbestos waste shall:

- Be double-bagged in case of one bag rupturing
- Be in appropriate polythene bags or wraps
- Not be more than half-filled if in the bag

- Have excess air in the bag carefully removed before sealing so there is no release of asbestos dust

All stored asbestos waste shall be clearly marked to indicate the presence of asbestos.

1.1.1. Project Concept

Environmental Hygiene is the science of anticipation, recognition, evaluation and control of health hazards in the work environment with the objective of protecting the health of workers and citizens of the community. Its role is first, to ensure a healthy work environment through continuous surveillance; second, to protect workers from diseases that can be caused by unhealthy environments; third, to break the vicious cycle of 'unhealthy environment' – occupational disease.

The company however sought the assistance of an environmental consultant to carry out an environmental impact assessment of the asbestos disposal site.

The aim of the project is to provide a facility that will offer solutions on safe disposal of asbestos from various entities that intend to dispose-off the asbestos roofing sheets. The facility should be in line with NEMA set out guidelines for asbestos handling and disposal. The specific objectives of the proposed project are:

- To safely remove and dispose off asbestos materials,
- To ensure that the handling of asbestos containing products or material during the disposal and clean-up is in accordance with regulatory requirements
- To minimize occupational exposures to asbestos fibers and future liabilities
- To protect employees and the community from contact with asbestos fibers during the disposal and subsequent clean up exercise
- To disclose to employees, contractors and the public, asbestos contaminated sites within the premises and pronounce on management of these.
- To advise its potential clients on viable disposal options of asbestos either offsite or onsite and execute the preferred options with professionalism.

The objective is to carry out the Environmental Impact Assessment (EIA) study to identify, predict and evaluate potential environmental and socio-economic effects which may result from the proposed disposal facility for asbestos and to develop suitable Environmental Management Plan (EMP) to mitigate the undesirable effects. The aim of Environmental Impact Assessment (EIA) is

to enable NEMA (which is the approving authority) and the developer to properly consider the potential environmental consequences of the project and to make recommendations to reduce it.

The specific objectives of the EIA are:-

- Establish the existing environmental conditions.
- To consider all possible positive and adverse impacts to the project area and its environs.
- Design and prepare mitigation measures and plans to address all the possible environmental impacts.
- Develop a comprehensive Environmental Management and Monitoring Plan for the proposed Asbestos Disposal Site.
- Development of post project environmental monitoring programme.

The EIA shall include literature review; field studies; risk assessment; impact assessment and EMP.

1.2. Brief about Asbestos

Asbestos is a group of naturally-occurring silicate minerals, made of soft, flexible fibres that take on a fluffy consistency when pulled. Resistant to heat, electricity and corrosion, asbestos was traditionally used to reinforce and add strength to cement, plastic and roofing materials.

Corrugated asbestos roofs are a familiar sight in Kenya in various buildings built before the 90's. Due to its superior strength, thermal qualities and fire retardancy, asbestos was widely used in roofing and insulation.

Research shows that undisturbed asbestos roofs in good condition typically do not pose a health risk if the asbestos fibres remain bound in solid cement. Asbestos fibres are microscopic. They cannot be seen, smelled or tasted. If a person ingests asbestos dust, the fibres will become permanently trapped in the body, triggering inflammation, scarring and causing genetic damage to the body's cells.

Asbestos roof sheets become more of a hazard over time, becoming brittle and deteriorating with exposure to the sun and rain. Once asbestos roof is damaged, the asbestos fibres may become

airborne and dangerous. The more weathered your roof becomes, the more significant the health risk.

Asbestos is known to cause fatal diseases such as asbestosis, lung cancer and mesothelioma. The symptoms of these diseases appear after about 20 to 30 years from first exposure.

No amount of asbestos can be considered safe, asbestos is most dangerous when a person is exposed to a strong concentration or exposed to moderate amounts on a regular basis for a long time.

To ensure elimination of risk of health complication that result from asbestos, use of asbestos material was banned in many countries amongst them Kenya. Currently, most property owners are replacing their asbestos roofing sheets with galvanized iron roofing sheets thus creating the need for a safe disposal site for the asbestos roofing sheets.

1.2.1. Asbestos as a contaminant

Most respirable asbestos fibers are invisible to the unaided human eye because their size is about 3–20 μm wide and can be as slim as 0.01 μm. Fibers ultimately form because when these minerals originally cooled and crystallized, they formed by the polymeric molecules lining up parallel with each other and forming oriented crystal lattices. These crystals thus have three cleavage planes, and in this case, there are two cleavage planes which are much weaker than the third. When sufficient force is applied, they tend to break along their weakest directions, resulting in a linear fragmentation pattern and hence a fibrous form. This fracture process can keep occurring and one larger asbestos fiber can ultimately become the source of hundreds of much thinner and smaller fibers.

As asbestos fibers get smaller and lighter, they more easily become airborne and human respiratory exposures can result. Fibers will eventually settle but may be re-suspended by air currents or other movement. When fibers or asbestos structures from asbestos containing materials (ACM) become airborne, the process is called primary release. Primary release mechanisms include abrasion, impaction, fallout, air erosion, vibration, and fire damage. Secondary release occurs when settled asbestos fibers and structures are re-suspended as a result of human activities. In unoccupied buildings or during unoccupied periods, fiber release typically occurs by fallout or is induced by vibration or air erosion.

1.2.2. The Need and Desirability of Asbestos Disposal Project

The presence of asbestos poses a long term environmental and human health risk to people, and therefore the need and urgency to dispose off and clean up the various premises and facilities in order to eliminate any further environmental and health risks. The asbestos materials and substances will be contained in one area which will be easily manageable rather than having different area or pieces of land with disposal points of asbestos. It will be much valuable for authority to consider issuing out the license for this facility since it will offer long term solutions for asbestos disposal menace within the republic.

1.2.3. The need for a License

The facility was subjected to full study after evaluating the impacts associated with this kind of project in length, it is important for the authority to issue this project with EIA license as a monitoring tool both during construction and operational phases.

1.2.4. Asbestos sheets removal

Waste containing asbestos in the form of dust or fibers is listed as hazardous according to the **fourth** and **fifth schedules** of regulations on waste management, **Legal Notice No. 121 of 2006.** As per the Environment Management and Coordination Act, 1999, the National Environment Management Authority (NEMA) has the responsibility of enforcing agency for all types of wastes, including hazardous wastes. According to the General provisions, section 23 of the Waste management Regulations, 'No person shall engage in any activity likely to generate any hazardous waste without a valid Environmental Impact Assessment licence issued by Authority under the provisions of the Act'

This EIA identifies, describes, and evaluates the potential environmental impacts that could result from the implementation of the proposed action. Resource areas most relevant to the proposed action are the focus of analysis. These include "Infrastructure and Utilities - Potential effects on sanitary sewer, potable water, solid waste management, drainage, transportation, and electricity. Potential effects on existing environmental and management practices for hazardous materials and wastes will also be assessed.

The proposed disposal site involved represents little ecological interest, being bare land. Air quality and health and safety issues are, however, considered more significant taking into account the national legislation on the issues. With adequate mitigation measures, environmental protection

policies would be largely satisfied. The on-site and off-site impacts are also considered to be significant enough to warrant investigation.

Warning and safety signage will be placed at the areas within the temporary site and the disposal site. Skilled staff/workers as well as a site supervisor will be required, and all will use the required Personal Protection Equipment (PPE). Unauthorised personnel will not be allowed near the work areas. All personnel involved with the asbestos disposal and remediation process will be subjected to medical surveillance as per the Occupational Health and Safety Act, 2007.

The asbestos workers coming in direct contact with asbestos waste will need to shower (using clean water) to remove any asbestos fibers from their PPE – decontamination suits on a daily basis. A fully functional decontamination unit or trailer will be utilized at each site. The decontamination unit, placed about 30 metres of the sites will consist of three chambers and will have a fully operational hot and cold running water system, adjustable at the shower tap, and a functional water filtration unit that will filter the water waste down to 5 microns prior to being tapped for disposal. Workers should wear a clean outer protective suit as they exit from the work area to the decontamination area.

The site that had asbestos pile will then be cleaned up. Prior to commencement of the disposal and clean-up, the asbestos sheets and the contaminated site shall be sprayed with water to suppress the release of fibers. Stock pilled asbestos waste shall be continuously sprayed with a mist of water during the disposal and cleaning process so as to effectively reduce and control the release of the fibers. Damp asbestos will be manually lifted by the use of shovels, forks or by hand and placed into 500 micro-plastic bags (Double bagged and labelled). The cleaning process will involve removing the soil overlain by the asbestos roofing wastes. The areas where any soil has been removed during the cleaning process will be backfilled with clean soil and covered.

Bagging

All asbestos to be disposed of at the proposed disposal site will be contained by layers that separate it from the environment. The layers will include two impermeable, high density plastic liners, alternating with thick layers of soil between and on top to cushion the material against puncture as well as geotextile sheets that further seal the disposal “cell.”

These procedures to seal the waste from contact with the environment make it extremely unlikely that any water could come into contact with the material. Medical experts recommend that asbestos simply be buried in an ordinary landfill since asbestos is not soluble in water and one must guard only against inhalation. The asbestos disposal activity at the site thus exceeds the requirements of the Environmental legislation.

Handling and Transportation

The handling and transportation of asbestos material shall be in accordance to waste regulations. All machinery involved in an asbestos disposal and clean-up process shall be jet-washed for asbestos contamination before leaving the sites.

Disposal

The removal of asbestos material from the temporary site to the disposal site will involve the asbestos workers excavating the asbestos material to remove it and the contaminated soil, and then placing it into airtight containers. Or wrapping and gently lifting the temporary stored asbestos materials into a NEMA licensed truck and transport to the NEMA Licensed landfill or licensed onsite disposal.

There are two options for disposing of asbestos:

- Asbestos waste is double-wrapped in 500 gauge thick plastic bags or sheeting, sealed with tape and labelled double wrapped and transported to a licensed asbestos disposal site .
- Label all bags with an appropriate warning such as:

CAUTION

ASBESTOS DO NOT DAMAGE OR OPEN BAG

DO NOT INHALE DUST

The disposal site will **be dug to a depth recommended in the hydrogeological survey report and it will be considered full once it's one meter below** the ground level. The wrapped/contained asbestos will then be gently put in the dug site and buried with soil layers. The proponent intends to dig approximately 10 metres below ground.

Asbestos waste must be disposed of at a licensed asbestos landfill. The site is usually operated by a NEMA licensed asbestos handler in this case the proponent site should obtain a license to

own/operate an asbestos disposal facility and a NEMA license to own an asbestos containing materials waste transportation vehicle; However potential proponents shall be given options to dispose onsite or offsite depending on their preference and cost implications. Our Company is ready to offer the services as preferred subject to compliance with NEMA requirements on offsite and onsite disposal.

- Asbestos waste is a regulated hazardous waste;
- Asbestos is a hazardous material that can have health effects to yourself and others if asbestos fibers become airborne;
- It is illegal to dispose of asbestos waste in domestic garbage bins;
- It is illegal to re-use, recycle or illegally dump asbestos products;
- It is illegal to store, sell or give away asbestos.

All employees will wear protective clothing. Each asbestos worker will be provided with

- An approved and unused disposable overall
- Clean boots
- Clean PVC gloves
- High filter Dust masks

Restrictions will be placed on the site where asbestos is buried. Land uses that involve digging of foundations that may expose asbestos to the surface will prohibited.

Before completion, certifications will be done on the sites surfaces to ensure that they are clear of asbestos.

1.2.5. The Project Cost

The project cost of KSh. Fifteen million is anticipated for, the main components of this programme is to provide for a temporary storage area (40ft container), asbestos pits, sanitary facility (washrooms, changing room, and birth room) entry gate, labor and provision of PPE's for the personnel and twenty-four hour security surveillance. However the cost of PPEs and other disposable equipment's will depend on disposals done.

Method statement on undertaking climate change risk and vulnerability assessment

Climate Change and Asbestos Removal

The intersection of climate change and asbestos removal has become a pressing concern due to the increased risk of asbestos exposure from extreme weather events. As climate change leads to more frequent and severe natural disasters, buildings containing asbestos are at greater risk of damage, potentially releasing harmful fibers into the environment.

Impact on Climate Change on Asbestos Exposure: Experts warn that climate change could significantly increase the potential for asbestos exposure. Many homes and public buildings in the U.S. contain legacy asbestos, a known carcinogen. With an estimated 10 million to 30 million homes affected, extreme weather events like hurricanes, floods, and wildfires pose a serious risk. Damage to these structures can lead to the release of asbestos fibers into the air, creating health hazards for nearby populations

Global Perspective on Asbestos Removal: In the UK, the government's Net Zero Strategy aims to address climate change while also managing asbestos risks. There is a push for a long-term approach to remove asbestos from public and commercial buildings by 2062. However, some officials argue against fixed deadlines for removal, suggesting that managing asbestos in place is safer until planned renovations occur. This approach raises concerns as aging materials are increasingly susceptible to degradation. Similarly, in Kenya, the government has initiated efforts to map and remove asbestos roofing from facilities, citing public health safety concerns. The Cabinet Secretary for Environment has directed that all facilities with asbestos roofs be identified and removed within three months.

Challenges in Asbestos Management: The management of asbestos during removal poses significant challenges. During such operations, there is a heightened risk of fiber emissions into the surrounding environment if proper containment measures are not followed. Studies indicate that inadequate negative pressure in work zones can lead to contamination of indoor air spaces even after removal efforts are completed. Moreover, climate-related events such as flooding can exacerbate this issue by damaging landfill sites where asbestos waste is stored, potentially releasing it back into the environment

Conclusion: The relationship between climate change and asbestos removal highlights an urgent need for comprehensive strategies that address both environmental health and safety. As extreme weather events become more prevalent due to climate change, coordinated efforts at local, national, and global levels will be essential to mitigate risks associated with asbestos exposure while effectively managing its removal from existing structures.

2.0. SITE DESCRIPTION

2.1.1. Location and Land use

The proposed site is located L.R. No. 8852 MZAMBARAUNI AREA, MTWAPA SUB-COUNTY, IN KILIFI COUNTY. The proposed site is geo-referenced as 2°48′28.3″S 40°01′08.3″E (-2.807850, 40.018964). The parcel of land is approximately 20 Acres size and there is no any development on the said parcel of land and the proponent intends to utilize approximately five acres for the disposal activities.

The site is located about 17 kilometres off Malindi –Lamu road from from Marereni town and is accessible through the earthen (murram) feeder road passing by H. Young quarry site. The site is neighbored by land parcels that are not developed at all, human settlement in this area is scattered. The area is sparsely populated.

There is vast land in the area and is used for grazing of animals mostly goats. Some people in the neighborhood do cultivation and plant crops during the rainy season. The land for the proposed project is owned by David Langat and Helen Langat who is one of the directors of HAZE CONNECT LIMITED as per the attached sale agreement.

Mzambarauni area in which the proposed site falls administratively is sparsely populated with an estimated population of 11,566 and is approximately 5427Km2 in area. The proposed project site is not neighbored by Residential area, no farms nor any shopping center within. From observation, neighboring parcels including site are virgin land as the area is occupied with natural vegetation forming bushes. The nearest homestead is about 1.5km away and shopping Centre is about 15km away from the proposed project site there are no rivers or water body within the proposed site therefore the proposed project site is suitable for commercial asbestos disposal.

Figure 1: Google map extract showing proposed project site

There is no visible river or water body within the proposed site. The approximate depth of the water table from ground is approximately 20 meters. attached, is a hydrological report. 2.1.2 Site Construction

The proposed disposal site is currently a bare land that is an isolated area with no residential neighborhoods around it.

2.1.2 Available utilities

Communication is achieved by land line, mobile telephones and radio which are available. The area is served by good road network, the proposed disposal site; paths for ease of movement and transportation are available.

3.0. PROJECT JUSTIFICATION AND ALTERNATIVES

Asbestos waste is defined as Hazardous Waste. It is an exposure to asbestos fibers that presents the health risk to people. Many studies have described a link between occupational exposure to various types of asbestos and lung cancer and associated diseases. Asbestos has therefore been designated as a known human carcinogen and hazardous substance. This carcinogenic activity is directly linked to the air pathway and ingestion of the fibers when swallowed.

The presence of asbestos within a premises poses a long term environmental and human health risk to people who operate on the/within that site. There are several persons, government departments, warehouses and factories within the Country who intend to remove the asbestos but does not have land for disposal of the same. This project therefore intends to provide solution of individual companies/organizations that intend to remove the asbestos and safely dispose them off in a licensed site. This will eliminate the asbestos in the human environment thus eliminating the risk associated with the asbestos.

The asbestos materials and substances will be contained in one area which will be easily manageable rather than having different area or pieces of land with disposal points of asbestos, it will be much valuable for authority to consider issuing out the license for this facility since it will offer long term solutions for asbestos disposal menace within the republic.

The proposed land use / development will outweigh the negative impacts of it. By removing the asbestos contaminated soil, further human health risk to the premises employees and nearby communities will be eliminated.

The assessment of technology alternatives is limited due to asbestos being a hazardous substance. The preferred option for handling asbestos is to remove and dispose the asbestos by burying in a special constructed pit.

4.0. PROCESS AND PROCEDURAL CONTEXT

After many years of economic growth, there has been concern for the state of environment in Kenya. This is due to degradation that has occurred in many areas which if not addressed now may jeopardize the future development. In 1994, the Government adopted an environmental action plan (NEAP) thereby committing itself to sustainable development. Such commitment has been

expressed further by the government's active participation at international meetings and programmes.

The Government's aims are, specifically, to:

- Increase efforts to mitigate the adverse effects of environmental degradation;
- monitor environmental performance of industries, commercial concerns and the agricultural sector; take strong and pro-active action on emerging environmental issues facing the nation;
- build partnerships with community Groups, non-governmental organizations, business and industries; and
- Facilitate public awareness and provide educational opportunities for people to learn about conservation and sustainable human development.

The enactment of the Environment Management and Coordination Act (EMCA) in 1999 was another milestone in the country's effort towards sustainable development. In line with provisions contained in Section 58 of the Act, ElAs are therefore being increasingly introduced into the national decision-making process and are basically aimed at alerting the decision-makers on the consequences of the proposed development on the environment.

5.0. METHODOLOGY

The assessment was conducted by use of the following methods: -

- Literature review, public and government sources
- Site reconnaissance
- Interviews with site personnel
- Use of an observation schedule
- Use of a checklist

Some questions whose answers had to be sought included:

- Are there potential physical or health hazards associated with the proposed activities to the premises workers?
- Will there be significant disturbance of existing communities?
- Are there potential impacts on the socio-economic interests?
- Are there any employment opportunities to be created by the proposed activity?
- Will the proposed project require major development to existing physical infrastructure, including transport and power generation?

- What would be the increased demand upon the existing provision of social services?

The site was visited so as to collect ground information by both observation and interviews to ascertain the collected information and to fill gaps where omissions or assumptions had been made. Observation was guided by a prepared schedule and involved ‘walk - through’ checks of the site grounds and the surroundings.

The Impact Assessment followed a scoping stage that enabled the identification of certain issues. Interested parties were contacted for their views on the project. After ascertaining that all details were available, this report was prepared.

6.0. POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

6.1. The Constitution of Kenya, 2010

The Constitution of Kenya 2010 is the supreme law of the land. Any other law that is inconsistent with the constitution is null and void to the extent of its inconsistency. Further any action by an individual or a state organ that contravenes the Constitution is null and void.

It promulgated, the right to a clean and decent environment is enshrined in the bill of rights 67

Article 67 (1) Every person has the right to—

(a) A clean and safe environment;

(b) Have the environment protected, for the benefit of present and future generations, through legislative and other measures that—

(i) Prevent pollution and ecological degradation;

(ii) Promote conservation; and

(iii) Secure ecologically sustainable development and use of natural resources; and

(c) Access information about the environment

The proponent strives to ensure that its activities are geared towards safeguarding the environmental rights of locals. The project will contribute towards eliminating a health disaster related asbestos roofing sheets including handling and disposal. the proponent will provide a facility that ensures a safe disposal of the asbestos material thus contributing to the enjoyment of the right to a clean environment. The project is a measure to safeguard the health of a bigger population.

Relevance to the proposed project

- *The proponent has a right to carry out the project within legal limits*
- *The proponent must ensure that the development is carried out in an ecologically, economically and socially sustainable manner*
- *The proponent is entitled to a fair administrative decision-making process from NEMA and other state organs.*
- *The proponent must ensure that all the applicable provisions of the Constitution are observed at all times.*

6.2. Policy framework

6.2.1. The National Environment Policy, 2013

The Policy provides a holistic framework to guide the management of the environment and natural resources in Kenya. It aspires to an integrated environmental management approach to issues in all government policies for sustainable development. It contains several guiding principles: ecosystem approach, precautionary, polluter-pays principle.

Kenya Vision 2030

It is the country's development blueprint, 2008 to 2030, which aims at making Kenya a newly leading industrializing "***middle income country providing high quality life for all its citizens by 2030***."

It is based on 3 pillars-**economic, social & political**. Environment sector falls under the social pillar. It also emphasizes the need to achieve economic growth in a sustainable manner.

The Kenya Vision 2030 has proposed specific strategies to protect the environment. These include:

- Promoting environmental conservation, reducing pollution and improving waste management through the design and application of economic incentives
- Commissioning of public-private partnerships
- Improving the capacity to adaptation of global climate change, etc.

The proposed project contributes towards reducing pollution and improving waste management in that the asbestos roofing sheets which are considered hazardous will have a safe disposal site unlike being disposed in open dumpsites or being reused.

6.3. Institutional Framework

6.3.1 NEMA

This is the government agency charged with the general supervision and coordination of all environmental matters in the Kenya. NEMA is the principal instrument of the government in the implementation of all policies relating to the environment. The facility should comply with NEMA's requirements/regulations on waste management, water quality, noise & vibrations, air quality, monitoring and other aspects.

6.3.2 Kilifi County Government

County Governments are empowered to make by-laws in respect of suppression of nuisances, imposing fees for any license or permit issued in respect of trade or charges for any services.

County Governments also are given power to control or prohibit all developments which may be or become a source of danger, discomfort or annoyance to the neighborhood, and to prescribe the conditions subject to which such developments shall be carried on. The proponent should comply with all applicable in Kilifi county Government laws and by-laws.

6.3.3 Directorate of Occupational Safety and Health Services

The mandate of the DOSHS is to ensure compliance with the provisions of the Occupational Safety and Health Act 2007 and promote safety and health of workers.

Some of the core functions include:

- Inspecting workplaces to ensure compliance with safety and health laws
- Investigation of workplace accidents and diseases with a view to preventing recurrence
- Medical examination of workers
- Training on Occupational Health and Safety, Fire Safety and First Aid
- Disseminating information on occupational safety and health to customers

6.3.4 National Environmental Tribunal (NET)

This tribunal guides the handling of cases related to environmental offences in the Republic of Kenya. If disputes to this project arise, they are supposed to be presented here for hearing and legal direction.

6.4. The Environmental Management and Co-Ordination Act of 1999.

Enacted in the year 1999, the Environmental Management & Coordination Act (EMCA) has put forth guidelines aimed at protecting Kenya's natural resources from pollution by industries and other anthropogenic activities.

The Act provides for the establishment of an appropriate legal and institutional framework for the management of the environment and for matters connected therewith. The Act is based on the recognition that improved legal and administrative co-ordination of the diverse sectoral initiatives is necessary in order to improve the national capacity for the management of the environment. It accepts the fundamental principle that the environment constitutes the foundation of our national economic, social, cultural and spiritual advancement. The Environmental Management and Co-ordination Act, 1999 establishes the legal and institutional framework for the co-ordination of the diverse sectoral initiatives for environmental management. The Act itself is a framework statute whose provisions can only be implemented through the promulgation of enabling regulations.

6.4.1 Environmental Impact Assessment

The National Environment Management Authority (NEMA) is mandated by the Environmental Management and coordination Act (EMCA) no 8 of 1999 to administer the EIA.

Project which requires EIA

a) The Revised second schedule of the Act (EMCA of 1999) specifies projects or activities, which must be subjected to environmental impact assessment (EIA). These too must be subject to environmental audit after one year of operation.
b) The proposed project falls under the Category of **High-Risk Project** as listed in the amended second schedule of the EMCA, CAP 387 and in line Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019. In this case the project is subject to Environmental Impact Assessment Sturdy.

The following is a summary of legislature relevant to this study extracted from the Act.

Section 58 (1)

Notwithstanding any approval, permit or license granted under this Act or any other law in force in Kenya, any person, being a proponent of a project, shall, before financing, commencing, proceeding with, carrying out, executing or conducting or causing to be financed, commenced, proceeded with, carried out, executed or conducted by another person any undertaking specified in the Second Schedule to this Act, submit a project report to the Authority, in the prescribed form, giving the prescribed information and which shall be accompanied by the prescribed fee.

Section 58 (2)

The proponent of a project shall undertake or cause to be undertaken at his own expense an environmental impact assessment study and prepare a report thereof where the Authority, being satisfied, after studying the project report submitted under subsection (1), that the intended project may or is likely to have or will have a significant impact on the environment, so directs.

Offences

Section 138

Any person who-

Fails to submit a project report contrary to the requirements of section 58 of this Act; Fails to prepare an environmental impact assessment report in accordance with the requirements of this Act or regulations made thereunder; Fraudulently makes false statements in an environmental impact assessment report submitted under this Act or regulations made thereunder; Commits an

offence and is liable for conviction and imprisonment for a term not exceeding **twenty four months** or to a fine of not more than **two million shillings** or to both such imprisonment and fine.

Section 139

Any person who: -

Fails to keep records required to be kept under this Act; fraudulently alters any records required to be kept under this Act; fraudulently makes false statements in any records required to be kept under this Act; commits an offence and is liable upon conviction to a fine of not more than **five hundred thousand shillings** or to imprisonment for a term of not more than **eighteen months** or to both such fine and imprisonment.

Section 72 (1)

Any person, who upon the coming into force of this Act (14/1/2000), discharges or applies any poison, toxic, noxious or obstructing matter, radioactive waste or other pollutants or permits any person to dump or discharge such matter into the aquatic environment in contravention of water pollution control standards established under this Part shall be guilty of an offence and liable to imprisonment for a term not exceeding two years or to a fine not exceeding one million shillings or to both such imprisonment and fine.

Section 72 (2)

A person found guilty under subsection (1) shall, in addition to any sentence or fine imposed on him: pay the cost of the removal of any poison, toxic, noxious or obstructing matter, radioactive waste or other pollutants, including the cost of restoration of the damaged environment, which may be incurred by a Government agency or organ in that respect; pay third parties reparation, cost of restoration, restitution or compensation as may be determined by a court of law on application by such third parties.

Other relevant sections include:

Section 59, - Publication of Environmental Impact Assessment

Section 60, - Comments of EIA report by Lead Agencies

Section 61, - Technical Advisory Committee on EIA

Section 62, - Further EIA

Section 63, - Environmental Impact Licence

Section 64, - Submission of fresh EIA report after EIA Licence issued

Section 65, - Transfer of EIA Licence

Section 66, - Protection in respect of an EIA Licence

Section 67, - Revocation, suspension or cancellation of EIA Licence

Section 68, - Environmental Audit

Section 69, - Environmental Monitoring

Section 78-85, - Air quality standards and emission licensing

Section 86 - **Standards for waste**

Section 87 - **Prohibition against dangerous handling and Disposal of wastes**

Section 90 - Court order to cease operation

Section 91-93 - **hazardous wastes**

Other relevant pieces of legislation related to this report include:

- The Public Health Act Cap 242
- Land Control Act, 2002
- Occupational Health and Safety Act, 2007
- The Food, Drugs and Chemical Substances Act Cap 254
- The Physical Planning Act, Cap 286
- The Land Planning Act Cap 303
- The Water Act, 2002
- Environmental Management and Co-ordination (Waste Management) regulation, Legal Notice No.121 of 2006
- Legal Notice No. 61 of 2009 on Noise Pollution Control.

Kenya is also a signatory to a number of different international conventions on the environment some of which include the above mentioned.

The proponent will be strictly guided by the **National Guidelines for safe Management and disposal of Asbestos, 2013.**

6.4.1 The Water Act, 2016

The Water Bill was gazetted in 2016 as the Water Act, and went into effect in 2017 when effective implementation of its provisions commenced. In furtherance to the Water Act 2016, the Ministry of Water and Irrigation and Water Resources Authority (WRA) in collaboration with other stakeholders has prepared a set of Regulations which have now been gazetted to give guidelines

on water permit acquisition and adherence to conditions attached and also enforcement of the user fee charges.

Relevance to the proposed project

- *The proponent will ensure that water usage in all phases of the project cycle is in line with the provisions of this Act and obtain a permit from WRA if a borehole will be considered as a source of water to supply the facility. The proponent will also ensure that the activities of the site does not cause any leachate that may cause water pollution.*

6.4.2 The Public Health Act- Laws of Kenya, Chapter 242

The Act prohibits activities that may be injurious to health. It then becomes the responsibility of the county government to maintain clean and sanitary conditions.

Relevance to the proposed project

- *Applicable during the entire project cycle in ensuring proper and hygienic methods are used within the facility.*
- *Maintain the completed building according to standards*
- *Ensure access to safe drinking water for the workers during the project life cycle*
- *The proponent will put measures to prevent activities that would be a nuisance to the public*

6.4.3 Occupiers Liability Act Cap 34

This is an Act of parliament to amend the law as to liability of occupiers and others for injury or damage resulting to persons or goods lawfully on land or property from dangers due to the state of the property or to things done or omitted to be done there.

Relevance to the proposed project

- *The proponent will ensure safety of workers during construction and possible decommissioning phases and residents upon operation phase of the development.*

6.5. The Factories and Other Places of Work (Hazardous Substances) Rules, 2007

Asbestos has been listed as a hazardous substance and its threshold limit values given, therefore these rules apply to all workplaces where asbestos is present and *the proponent will ensure to fully adhere to this Act once the project commences.*

6.5.1 The Factories (Building, Operations and Work of Engineering Construction) Rules, Legal Notice No. 40 of 1984

The Factories (Building, Operations and Work of Engineering Construction) Rules, Legal Notice No 40 of 1984, rules 20 and 21 prohibit any inhalation of dust and fumes. In any building operation or work of engineering construction where dust or fumes likely to be injurious to the health of persons employed are given off, all reasonably practicable measures shall be taken to prevent the inhalation of dust or fumes by the person employed by ensuring adequate ventilation or providing suitable respirators at the place where the operation or work is carried on.

Principal Act	Responsible Institution	How it applies to the facility	Remarks
The constitution of Kenya (2010)	**GoK**	Article 67 (1) Every person has the right to— (a) A clean and safe environment; (b) Have the environment protected, for the benefit of present and future generations, through legislative and other measures that— (i) Prevent pollution and ecological degradation; (ii) Promote conservation; and (iii) Secure ecologically sustainable development and use of natural resources; and (c) Access information about the environment	The proponent shall strive to ensure their activities don't interfere with the right to clean environment by the public or neighbours.

Environment management and Co-ordination Act Cap. 387	**NEMA**	Section 58 makes it a requirement that no project listed in schedule 2 of this Act to undergo EIA licensing by NEMA before its commencement. Part VII Section 68 of the Act requires The owner of the premises or the operator of a project to keep accurate records and make environmental audit reports for submission to the Authority describing how far the project conforms in operation with the legal requirements. It requires the owner of premises or the operator of a project to take all reasonable measures to mitigate any undesirable effects and shall prepare and submit an environmental audit report on those measures to the Authority annually or as the Authority may, in writing, require. Section 74 of this Act requires that all industrial undertakings not connected to sewerage system managed by local authority to install an appropriate plant for the treatment of such effluents before they are discharged into the environment and to apply for Effluent Discharge License. Section 80 requires that an owner or operator of a trade, industrial undertaking or an establishment that emits a substance or energy which is causes or is likely to cause air pollution to apply to the Authority for an emission licence. Section 87 (4) requires any person whose activities generate waste to employ measures that minimise wastes through treatment, reclamation and recycling.	The proponent shall be carrying out annual environmental audit reports to check on efficacy of EMP Proponent shall apply for all requisite licenses for operation of a waste disposal site

Environmental Impact Assessment and Audit) Regulations, 2003	**NEMA**	Regulation 31 makes it a requirement to carry out environmental audits. Regulation 32-36 give the standards the Audit should meet and gives the procedure.	The proponent shall cause to be carried out annual environmental audits once project is operational
Environmental Management and Coordination (Waste Management) Regulations, 2006	**NEMA**	Requires the Facility to: – Segregates waste (hazardous and non-hazardous) by type and then disposes the wastes in an environmentally acceptable manner – Contract a NEMA licensed Waste handler – Label hazardous waste containers in accordance with section 24 of the Regulations – Any business/industrial operator who generates waste to minimize the waste generated by adopting cleaner production principles that include improvement of production process through eliminating use of toxic raw material; improvement of production process through conservation of energy and raw materials; enabling the recovery and re-use of the product where possible; reclamation and recycling.	The proponent shall apply for license to operate disposal site. Proponent shall ensure all vehicles transporting asbestos to this site are NEMA licensed

Environmental Management and Coordination (Water Quality) Regulations,2006	**NEMA**	The Regulation requires the Facility to: – Refrain from any activity which might cause water pollution. – Not to discharge any liquid, gaseous or solid into water resource as to cause pollution. – Acquire EIA license prior to abstracting ground water or any activity that is likely to have any adverse impact on the quantity and quality of the water – Follow the monitoring guide set out in the Third Schedule to the regulation when discharging effluent into the environment – Carry out effluent discharge quality and quantity monitoring in accordance with methods and procedures of sampling and analysis prescribed by the Authority, and shall submit quarterly records of such monitoring to the Authority (NEMA). – Regulation 6 makes it a requirement for any entity discharging effluent into environment to apply for Effluent Discharge license from NEMA	– Waste water from washrooms is managed by use of septic tank and soak pit – The proponent shall put in place measures to prevent underground water pollution

Environmental Management and Coordination (Air quality) regulations, 2014	**NEMA CGM**	Formulated to provide for prevention, control and abatement of air pollution to ensure clean and healthy ambient air. These Regulations prohibit any operator of a trade or industry from: - Causing emission of any air pollutant from controlled facility listed in fourteenth schedule without a valid emission license. - Causing emission of any air pollutant from any point sources in levels exceeding set standards. - Acting in a way that directly or indirectly cause or may cause air pollution to exceed levels set out in the second Schedule to the Regulations - Allowing particulates emissions into the atmosphere from any source not listed in the six schedule of the Regulations - Causing ambient air quality in controlled areas (listed in Schedule Thirteen) to exceed the set standards. - All persons whose operations cause or are likely to cause the emission of pollutants in excess of the limits set out these regulations shall install air pollution control system as per seventh schedule of these regulations - The owner or operator of a controlled facility to ensure that exposure of workers to occupational air pollutants is monitored and recorded in accordance with the Tenth Schedule.	The proponent shall always ensure asbestos roofing sheets are wetted before their removal from the house

Occupational Health and Safety Act, 2007	**DOSHS NEMA**	Requires the facility to: • Comply with general duties with respect to health and safety in the workplace. Such duties include undertaking S&H risk assessments, S&H audits, notification of accidents, injuries and dangerous occurrences, etc. • Register the workplace with the DOSHS • Maintain cleanliness in the workplace, avoid overcrowding and provide ventilation • Maintain general welfare conditions such as First Aid facilities, supply of drinking water. • Manage health, safety and welfare by establishing work permit systems, providing PPE requirements and undertaking medical surveillance. • Ensure that there are an appropriate number of certified first aiders trained by an approved institutions and that the certification of these first aiders is current; • Provide a General Register for recording amongst other things all incidents, accidents and occupational injuries	The proponent shall ensure he has; • Provided a First Aid box for handling first aid cases at the site; • Provided PPEs for use by all the employees; • Provided firefighting equipment; • Provided sanitary conveniences (toilets) to the employees; • provided general register and record all incidents • ensured employee training on first aid, occupational health, safety and environment issues - Register the premises with DOSHS as a workplace

7.0. DESCRIPTION OF ENVIRONMENT

7.1. Introduction

This section discusses baseline information of the study area in covering, climate, hydrology, geology, soils, land use, water supply and population.

7.2. Project Location

The proposed asbestos disposal site is located north of Malindi town on L.R. No. 8852 MZAMBARAUNI AREA, MTWAPA SUB-COUNTY, IN KILIFI COUNTY. The proposed site is geo-referenced as **GPS Coordinates -3.930411, 39.752184**

The location in which the proposed site falls administratively is sparsely populated with an estimated population of 11,566 and is approximately 5427Km^2 in area. The site is located about 17 kilometres off Malindi –Lamu road from Mtwapa town and is accessible through the earthen (murram) feeder road passing by Green wood hotel

From the initial analysis, the site was found to be suitable for the proposed development. No activities were ongoing on site.

7.3. Physical Environment

7.1.1. Climate (hydrology and meteorology)

The proposed project site located in Magarini Sub-County north of Malindi lies in the Monsoon belt, with prevailing winds predominantly from the north east during the months of November-March and mainly from the South East during the month of April to September. The climate of Malindi – Magarini is usually hot and humid all year round.

Mean daily temperatures range from 22ºC - 30ºC. The calculated average annual temperature for the area is 27ºC while the mean maximum and minimum temperatures are 30ºC and 23ºC respectively.

The area experiences bimodal rainfall pattern with short rains occurring between October to December and the long rains occurring between April to June. There are two dry periods; January-March and July – September. In most coastal regions of East Africa, rainfall decreases from the coast towards the hinterland. The average rainfall ranges from 400mm in the hinterland to over 1200mm along the coastal belt. The coastal belt receives more rainfall compared to the hinterland ranging between 900mm to 1100mm due to the effect of monsoon winds.

7.1.2 Geology

The geology of Kenya's coastal strip was determined by the rifting and break-up of the palaeozoic Gondwana continent. Jurassic rifting of a Permo-Triassic basin filled with terrestrial clastic material into a pre-marine basin on the eastern edge of the African plate. These characteristics are generically the same as Southern Africa's Karoo sediments. Reworking and uplift led to the deposition of marine and peri-marine sediments, culmination in an erosive hiatus from Cretaceous to mid-Neogene times (the Pliocene). Fresh uplift led to the deposition of fluviatile pebble beds, gravels and sands of the Magarini/ Kilindini formation on older competent sediments. At Pleistocene times, sea level changes led to transgressions and regressions, leaving behind raised sands and fossil coral limestones (Horkel et al., 1984). Consequently, the hydrogeology of corals is characterised by good interconnectivity of pores which subsequently result into good permeability hence poor fair discharge & recharge of the aquifers in this region.

The subject area is Magarini sub-county i.e. from Gongoni, Marereni, Adu, Ramada, Fundi Isa and Marafa. The area is composed of unconsolidated to slightly consolidated rocks of tertiary and Quarternary origin. The oldest formation in the area is the Fundi Isa limestone which are the Miocene age (L.A.J. Williams, 1962). They consist of yellow limestone, fine grained calcareous sandstone, marls and sands.

Exposure of Fundi Isa limestone are restricted to small water courses near the Hadu-Marafa and Hadu-Fundi Isa roads. The Marafa beds now referred to as the Marafa formations are well exposed on an erosional scarp (Hell's Kitchen) north of Marafa village after which they are named.

Around Magarini village there are exposures of red sands which have been named after village as 'Magarini sands'. The sands are even grained and well sorted. The quartz grains are coated with very thin film of ferric oxide (Fe_2O_3).

7.1.3. Physiography

The area can be divided into three physiographic units, namely coastal uplands, coastal plains and minor valleys and valley bottoms.

The coastal plains cover the bulk of the area. They are mainly gently undulating with slopes varying from 0% to 8%. However, the eroded parts in Marafa (Hell's Kitchen) has slopes up to 16%. The altitude ranges from about 40m to slightly over 150m above mean sea level around Magarini.

The coastal plains occupy only a very small portion of the eastern part of the area. The land generally nearly level to gently undulating with slopes mainly varying from 0 to 2%. The altitude is under 40m above the mean sea level.

Minor valleys and valley bottoms are encountered along the stream and drainage ways distributed all over the area. The slopes vary from 0-5%.

7.1. Biological Environment.

7.1.1. Flora and Fauna

Mazambarauni area is sparsely populated and people have large tracks of land most covered with bush woodland. The area under cultivation is very small. Grazing/browsing is the main land use and accounts for over 70% of the settled plots. The main animal types found within the area are mostly domestic animals. The dominant animals' breeds are the gala goats, the small east African goats and the Zebu cattle.

The proposed project site is currently undeveloped with few shrubs and few trees. The shrubs will be cleared during the site preparation but the trees will remain intact. The neighboring property is undeveloped parcel of land.

7.2. Population dynamics

The population of the County 30 years ago was approximately 45,000 persons. According to the 1999 census, the County had a population of 244,945 persons. However, this has shot up to well over 284,657persons (2009 census) with population densities ranging from 3 persons per km^2 to more than 800 persons per km^2. The population distribution is varied with most people living in the high potential areas of the foot slopes of the hills and in urban centers.

The population of Kilifi County in 2019 stood 1,453,787 individuals spread over an area of 12,245.90 square kilometres. The population of males was 101 852 and that of females 104897. Magarini Sub-County as per 2019 census has a population of 191,610 over an area of 5,229$Km.^{2.}$ The project site area is sparsely populated with Adu location in which the proposed site falls having a population estimate of 13,367 people. Kamale Sub-location has a population of 3,185 over an area of 1,456.1$Km.^{2.}$

7.2.1 Demographic Characteristics

Kilifi is a cosmopolitan area with mixed ethnic groups. Kilifi County has its Capital in Kilifi town. The county has a population of 1,453,787 and covers an area of 12,245.90Km^2. Mtwapa Sub-County is located north of Malindi town which as per 2019 census has a population of 191,610. The project site area is sparsely populated with Mazambarauni location in which the proposed site falls having a population estimate of 13,367 people. Mtwapa Sub-location has a population of 3,185 over an area of 1,456.1Km.$^{2.}$

The area is composed majorly made up of the local community is the giriama tribe which is among the Mijikenda community. Other tribes from Kenya have also started buying land in the area for agricultural purposes

The areas major religion is Christianity.

7.2.2 Socio-economic

Major economic activities in Mtwapa Sub-County are salt harvesting and tourism. Charcoal burning is also rampant in the area

Road access in the rea has improved as the main access roads to Mzambarauni have undergone levelling and spot murraming.

8.0. ANALYSIS OF ALTERNATIVES

8.1 Project Alternatives

Two project alternatives are available namely the 'no project' alternative and 'yes project' alternative. Analysis of each alternative is as follows.

8.2 The "no project" alternative

This option will mean that the project will not be undertaken. This implies that the proposed bakery will not be established. This implies that the proponent of this facility will have to look for alternative land elsewhere.

In analyzing this option, the following was considered: -:

- Employment creation, the current government policy on employment and wealth creation aims at creating as many jobs as possible annually this can be realized by encouraging and supporting projects such as the proposed one. If the 'no option project' was to be considered, then this government target may not be realized.
- Financial investment: The 'no' option will mean that the proponent would have incurred financial implications in purchase of land and cost of documentation;
- The overall goal of safe disposal of asbestos material will not be achieved as existing facilities may not be enough for the quantity of asbestos in Kenya
- Income to government Income in form of taxes to the central government from the facility will not be realized.

8.3 The 'yes project alternative'

This was considered to be a viable option. This option was considered viable as opposed to the 'no option' because:

- Jobs will be created in the area;
- It will contribute to ensuring safe disposal of asbestos thus reducing risk of health hazards associated with asbestos;
- There will be increased revenue inform of taxes to the government.

8.4 Alternative Site

This will involve looking for another project site. The disposal site is always required to be away from human settlement. This proposed project site is far from human settlement. The nearest

homestead is approximately 2.5km. Furthermore, the proponent does not have a suitable location other than this land and the land under question is about 20 acres undeveloped.

8.5 Alternative Technology

The assessment of technology alternatives is limited due to asbestos being a hazardous substance. The preferred option for handling asbestos is to remove and dispose the asbestos through burial in constructed pits. The asbestos materials will be disposed off in underground concrete confinement (asbestos pit). The confinement will have a depth of approximately 10 metres below the ground level.

Conclusion

In light of the above analysis, yes project alternative will be preferred to no alternative because: -

- The area is sparsely populated – Project site has no human settlement in it.
- Land is unutilized and is covered with bushes
- Proponent has already incurred costs
- There will be more taxes due to government if facility is constructed as more work will attract more taxes.

9.0. CONSULTATION WITH NEIGHBOURS

9.1 Introduction

Stakeholder engagements will be undertaken by holding two meetings. The first meeting will be held on the with the leadership of Mzambarauni area which includes the village elders, the ward admins and the chief and will involve introducing the project to them, the scope what the works will entail, the project activities to be undertaken, the mitigation measures to be undertake, the stakeholder engagements to be used.

The second meeting involving public and community members from Mzambarauni villages This included the area Chief, community members, the neighbors to the project site, local business representatives, neighboring schools' representative's environmental groups, church leaders, individual community members. Minutes to the meeting and the attendance list will be annexures in this report

Goals of Stakeholder Consultations

The primary goals of the consultation process are to:

a. Ensure transparency and involvement of stakeholders in assessing and managing the potential environmental and socio-economic impacts of the project;
b. Help manage risks, concerns and public expectations through ongoing dialogue with stakeholders;
c. Improve decision-making and build understanding by actively involving key project stakeholders and PAPs in two-way communication. Through this process, the implementing agencies will better understand the concerns and expectations of stakeholders, beneficiaries and PAPs, and the opportunities to increase project value to the local community.

Objectives of Stakeholder Consultation

The consultations with stakeholders and communities were carried out to specifically achieve the following objectives:

a. To provide information about the proposed project and to collate stakeholder information on key environmental and social baseline information in the project area;
b. To provide opportunities to the stakeholders and communities to discuss their opinions and concerns respectively and get a full appreciation of their expectations;
c. To solicit the stakeholders' views on the proposed project and discuss their involvement in the various project activities;
d. To discern the attitudes of the community and their leaders towards the proposed project so that their views and proposals are taken into consideration in the formulation of mitigation and benefit enhancement measures;
e. To identify specific interests of and to enhance the participation of the poor and vulnerable groups; and
f. To inform the process of developing appropriate mitigation measures as well as institutional arrangements for effective implementation of the project.

Public consultation with regard to proposed facility was conducted as required in the Environmental Impact Assessment and Audit Regulations of June 2003. The consultation was vital and served to: -

- Inform all neighbours of the proposed facility within their locality;
- Explain to the neighbours the nature of the proposed project, its objectives and scope;
- Give neighbours an opportunity to present their views, concerns and issues regarding the proposed facility; and
- Obtain suggestion from neighbours on possible ways that they fill potential negative impacts can be effectively mitigated.

9.2 Comments from neighbours

A 'baraza' was held on 10th November, 2022 at the proposed site. The 'baraza' was chaired by the area assistant Chief, Mr. Justin Karisa and was representing the area chief Mr. Patrick Charo who was the organiser of the meeting. Present were community members, village elders, 'Nyumba Kumi' and community policing team of the area. Various neighbours were also in attendance. (*See attached minutes for the baraza*).

The list of members of the public interviewed is attached on the annex.

Issues Raised

- The lifespan of the constructed pit or will it come a time it will deteriorate and collapse thus affect futue generation
- Elaboration on negative impacts of the project
- Assurance that locals will be involved in the project – they be prioritized in employment
- How the community will be protected against inhaling the fibre
- The proposed project has helped raise awareness on risks of asbestos in the surrounding community

Figure 2: First photo showing address by area assistant Chief, attendees and last photo is address from EIA team member

10.0. IDENTIFICATION AND PREDICTION OF IMPACTS

In line with the EIA Regulations, the following methodology was used in assessing impacts related to the proposed asbestos disposal and subsequent clean-up of the temporary storage site. All impacts are assessed according to the following criteria:

» The **nature**, a description of what causes the effect, what will be affected and how it will be affected.

» The **extent**, wherein it is indicated whether the impact will be local (limited to the immediate area or site of activity), regional, national or international. A score of between 1 and 5 is assigned as appropriate (with a score of 1 being low and a score of 5 being high).

» The **duration**, wherein it is indicated whether:

- The lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
- The lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
- Medium-term (5–15 years) – assigned a score of 3;
- Long term (> 15 years) - assigned a score of 4; or;
- Permanent - assigned a score of 5.

» The **magnitude**, quantified on a scale from 0-10, where a score is assigned:

- 0 is small and will have no effect on the environment;
- is minor and will not result in an impact on processes;
- is low and will cause a slight impact on processes;
- 6 is moderate and will result in processes continuing but in a modified way;
- 8 is high (processes are altered to the extent that they temporarily cease); and
- 10 is very high and results in complete destruction of patterns and permanent cessation of processes.

» The **probability** of occurrence, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale, and a score assigned:

- Assigned a score of 1–5, where 1 is very improbable (probably will not happen);
- Assigned a score of 2 is improbable (some possibility, but low likelihood);
- Assigned a score of 3 is probable (distinct possibility);
- Assigned a score of 4 is highly probable (most likely); and
- Assigned a score of 5 is definite (impact will occur regardless of any prevention measures).

» The **significance**, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high.

» The **status**, which is described as either positive, negative or neutral.

» The degree to which the impact can be reversed.

» The degree to which the impact may cause irreplaceable loss of resources.

» The degree to which the impact can be mitigated.

The significance is determined by combining the criteria in the following formula:

S= (E+D+M) P; where

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

The significance weightings for each potential impact are as follows:

» < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to carry out the project in the area),

» 30-60 points: Medium (i.e. where the impact could influence the decision to carry out the project in the area unless it is effectively mitigated),

» > 60 points: High (i.e. where the impact must have an influence on the decision process to carry out the project in the area).

(A) Impacts that may result from the planning, design, construction, operational, decommissioning, and closure phases as well as proposed management of identified impacts and proposed mitigation measures

This environmental assessment has considered the impact of the asbestos disposal and cleanup on the receiving environment. It is not a retrospective impact assessment of what asbestos contamination has occurred on the site. The disposal and clean up of asbestos contaminated land will be a once-off activity and therefore planning, design, construction and operational phases are not applicable to the asbestos disposal and site clean-up at the premises. The potential impacts from the asbestos disposal and cleanup (direct, indirect and / cumulative) are detailed below.

An assessment of the “no-go alternative” (i.e. the option for not undertaking the asbestos disposal and clean-up) is included in this assessment; however, the no-go option is not preferred.

- **The No-Go Option**

Asbestos is heat resistant and mostly impervious to chemical treatment. It has no odor and is not soluble in water. When asbestos fibers are airborne then it poses the main health risk to people operating at the premises or in the surrounding areas (either by inhalation or ingestion of the fibers).

It is possible for Clumps of asbestos to be mixed within soil within the premises (soil that has been handled many times) to a point where the asbestos has separated literally into millions of small fibers that are invisible to the naked eye. The assessment process has identified the potential for asbestos to be present in the soil which may be released into the atmosphere from materials that may be present on the site, including material buried at insufficient depths, as well as wind erosion, weathering and/or disturbance, for example by heavy vehicle movement or construction work. There is therefore the need to obtain a waste license which would be applicable in the event that remediation of this site is required in the future.

Asbestos concentrations as low as 0.001% (weight basis) in loose, coarse textured soil may give rise to measurable levels of airborne asbestos, if disturbed. In an attempt to provide some sense of risk, the following must be borne in mind: A single asbestos bundle the size of a human hair through a microscope has the appearance of a large untwisted, steel cable i.e. made up of hundreds of smaller strands (fibers, in the case of asbestos). Asbestos fibers tend to fracture longitudinally (along their length) and if airborne, could release thousands of fibers into the air. These small diameter fibers (not visible to the human eye) and fiber-containing particles may remain suspended in the air for a long time and can be carried long distances by wind or water before settling.

Should Asbestos remain on the temporary site, and that soil containing asbestos fibers be disturbed and asbestos fibers released into the atmosphere, the main health risks that the asbestos potentially pose to HAZE CONNECT LIMITED Ltd employees and people located directly next to the sites include:

- Asbestosis: Exposure to airborne asbestos fibers can cause pulmonary fibrosis. The lungs build up fibrotic scar tissue around asbestos fibers which causes difficulty in breathing, decrease blood flow to lungs which results in poor oxygen exchange, enlarged heart, a persistent dry cough and ultimately death.

- Lung Cancer: A disease characterized by uncontrolled cell growth in tissues of the lung. If left untreated, this growth can spread beyond the lung in a process called metastasis into nearby tissue and, eventually, into other parts of the body.
- Mesothelioma: This is a rare form of cancer that affects thin membranes which surround the lungs and other internal organs.
- Cancer of pleura and peritoneum.
- Cancer of bronchus.
- Cancer of intestines.
- Warts or corns: Dermal contact with asbestos can result in the formation of warts or corns.

Asbestos fibers are chemically inert. They do not evaporate, dissolve, burn or biodegrade in the environment. However, single fibers and clumps of fibers may be released in the air as dust as a result of wind erosion and other types of activities that generate dust. Once inhaled, fibers may be deposited and retained in the airways and lung tissue. Because asbestos fibers remain in the body, each exposure to asbestos increases the likelihood of developing an asbestos related disease. Many of these diseases caused by asbestos (asbestosis, mesothelioma, lung cancer) take between 15 and 40 years to be diagnosed.

The human respiratory system is therefore assumed to accumulate fibers linearly with concentration. For this reason alone, the cumulative nature of asbestos in the lungs, be it in small doses over long periods of time or a single large dose over a few hours or days, the health risks posed to potentially exposed premises employees and contractors, should not be underestimated. The illnesses listed above are dependent on the degree and frequency of exposure by an individual. In addition, there is a long time period between initial exposure and the development of asbestos-related disease.

The option for not implementing the asbestos clean-up is not preferred from a legal and human-health perceptive. A summary table of the impact (baseline conditions) that may continue to occur at the premises and its environs should the asbestos disposal and clean-up not take place is provided below.

Nature: Negative effects of airborne asbestos fibers on human health (HAZE CONNECT LIMITED Ltd employees who access the areas containing asbestos fibers) prior implementation of mitigation measures.	
Extent	Local (1)

Duration	Permanent (5)
Magnitude	High (8)
Probability	Improbable (2)
Significance	**Low (28)**
Status (positive or negative)	Negative
Reversibility	Not reversible
Irreplaceable loss of resources?	Yes (may result is illness and mortality of people)
Can impacts be mitigated?	Yes
Mitigation: (1) Undertake the asbestos disposal and clean-up to remove visible asbestos waste and contaminated soil as soon as any asbestos is removed to the burial site	
Cumulative impacts: Cumulative health impacts may result on the premises employees and people who operate at the premises if asbestos is not removed	

- **Potential Impact on health of asbestos workers and Premises employees during the disposal and Clean-Up**

Asbestos containing dust is a complex mixture of fibrous structures. Not only do single fibers vary in dimensions but also such fibers may be found combined with other fibers in the form of bundles, clusters, or matrices. These are known as asbestos structures that can be inhaled. The relationship between soil and air levels of asbestos fibers is therefore considered complex. The potential for asbestos fibers to become airborne depends on the type of work activities as well as natural activities such as wind, i.e. the potential for mechanical disruption of the soil by human and/or natural activities. The removal/disposal of asbestos and asbestos containing materials, including soil, is anticipated to be **high risk** work. Suitable precautionary measures must be implemented during asbestos sheet removal or even the disturbance of asbestos contaminated soil in order to minimize the potential for the release of the fibers into the air.

Mitigation measures are essential to avoid exposure of the asbestos workers, employees who operate at the temporary site and the final disposal site and members of the public who may use the sites or reside in close proximity of the sites, when the asbestos is being lifted by an excavator or manually using shovels and forks. In the absence of mitigation measures, and if people (mainly

employees conducting the disposal and clean-up) inhale or ingest asbestos fibers while the asbestos clean-up is underway, the following negative human health effects may occur in the long term (note that it takes years before these effects could materialize and would be related to the level of exposure):

» Asbestosis (note that asbestosis is incurable).

» Lung Cancer (can be treated but however can also result in death).

» Mesothelioma (can be treated but however can also result in death)

» Cancer of bronchus, Cancer of intestines (can be treated but however can also result in death)

» Warts or corns (Dermal) (can be treated)

A potential public health risk exists within 100 metres of the areas of the asbestos disposal and clean-up, unless the recommended mitigation measures are implemented. The impact table below summarizes the potential impact on human health during the disposal and clean-up with and without mitigation / precautionary measures.

Nature: Direct impact on human health during the disposal and clean-up due to the release of airborne asbestos fibers		
	Without mitigation	**With mitigation**
Extent	local (1)	local (1)
Duration	permanent (5)	Short – duration (2)
Magnitude	moderate (8)	Moderate (6)
Probability	definite (5)	Improbable (2)
Significance	**high(70)**	**low (18)**
Status (positive or negative)	Negative	negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes (may result is illness and/ mortality of people)	No
Can impacts be mitigated?	Yes	

Mitigation:

- All employees will wear protective clothing during the exercise. Each asbestos worker will be provided and equipped with:
  - o An approved unused disposable overall
  - o Clean gum boots
  - o Clean PVC gloves
- Demarcate the areas of removal of contaminated soil. A respirator zone is an area where the concentration of regulated asbestos fibers in the air is, or is likely to be greater than the OEL for asbestos. No persons should be allowed to enter the area without wearing respiratory protective equipment and protective clothing. Respirator zones must be clearly demarcated and identified to prevent accidental

and chance, albeit brief, entry. Even if a person passes through the area or there is little work being conducted in that area, a respirator must be worn.

- Ground markings are examples of demarcation where the area is not defined by walls. In addition, all access routes should be demarcated and identified by symbolic warning signs that are clearly visible.
- Wire fencing will be used for high risk areas.
- Warning & Safety signage will be placed at the areas within the premises for clean-up on the site.
- No member of the public to be allowed near of the works area.
- All personnel involved with the asbestos disposal process will be subjected to medical surveillance.
- Asbestos contaminated areas shall be sprayed with water prior to commencement of cleaning activities in order to suppress the release of fibers.
- Clearing of asbestos at any site shall be completed entirely before moving onto a new working site.
- Temporary storage of waste: the area currently used for stockpiling of excavated material shall be lined with impermeable material.
- All machinery involved in an asbestos disposal process will be jet-washed prior to leaving site.
- Asbestos air sampling will be conducted on the sites for clean-up
- The employer must not allow anybody to work in or to enter an environment in which they may be exposed to asbestos that will exceed the exposure limit for asbestos.
- When there is a visible dust or winds in excess of 20 knots, any asbestos disposal and cleaning process will be stopped.
- Thorough, complete and up to date records should be kept of:
    - o Medical surveillance of asbestos workers for a minimum period of 40 years;
    - o Maintenance of control measures for a period of 3 years;
    - o Asbestos inventory for minimum period of 40 years;
    - o Training given to employee in terms of Asbestos Regulations for as long as the employee remains employed at the workplace in which he or she is being exposed to asbestos dust; and
    - o Assessments and air monitoring at the sites that were cleaned

16. Transportation
    - Ensure all asbestos is collected and loaded into a transportation vehicle licensed by NEMA
    - The transporting vessel (truck will be lined with polythene).
    - The transporting vessel shall be labelled <HAZARDOUS WASTE<
    - The waste shall be transported to the disposal site in an enclosed vehicle.
    - The tenderer shall have a documented HSE policy and ensure that all persons involved in asbestos handling are appropriately inducted/trained in emergency procedures e.g. how to handle asbestos waste, services to be contacted during such spillages.

Cumulative impacts:

Cumulative health impacts may result on the premises employees and people who operate at the premises if the asbestos is not removed, or if spillage/breakage occurs while removing the asbestos.

- **Safety risk to asbestos workers while working at the Sites**

While working at the temporary and disposal sites, the asbestos workers will face daily safety risks. These include:

» Uneven walkways

» Dust

» The handling and transportation of dangerous substances

These hazards have the potential to cause injury or death to the workers/contractors who will be undertaking the asbestos-clean-up and disposal. In this regard, HAZE CONNECT LIMITED Limited. has a Safety, Health and Environmental policy that will apply to the asbestos disposal and clean-up workers to avoid and minimize injuries or fatalities on their premises (see attached Health Safety and Environment policy).

Nature: Safety risks to asbestos workers while working at the concerned sites		
	Without mitigation	**With mitigation**
Extent	local (1)	local (1)
Duration	Short (5)	Short – duration (2)
Magnitude	High (8)	Moderate (6)
Probability	Probable (3)	Improbable (2)
Significance	**medium (33)**	**low (18)**
Status	negative	negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes (may result is illness and/ mortality of workers)	No
Can impacts be mitigated?	Yes	
Mitigation: » HAZE CONNECT LIMITED Ltd Safety, Health and Environmental (SHE) policy will apply to the asbestos workers. » All employees will wear protective clothing during the disposal and clean-up of the area. Each asbestos worker will be provided and equipped with: o An approved unused disposable overall o gum boots o PVC gloves o dust mask » In addition, high visibility vests must be worn at all times.		

» The asbestos project team who will access the area must be in possession of a valid premises access card. » If more than 20 employees are involved, the employer must have a Health and Safety representative (1 per 50 employees). » The asbestos site manager shall establish a health and safety committee. The committee shall comprise of the following personnel: o Site manager o SHE representative o Premises representative » There must be a health and safety plan that is kept onsite which must contain appropriate safety measures. » Employees must be trained on the contents of the health and safety plan » The premises first aiders must be available to the asbestos workers » A first aid kit must be kept onsite.
Cumulative impacts: The safety risk will be faced whenever the asbestos workers are at the site - an occupational hazard.

- **Impact on soil during asbestos clean-up**

During the clean-up activities, the contaminated soil will be removed and disposed of at the disposal site– this will result in a loss of soil, which will be replaced with either clean soil or stone at relevant areas where asbestos remediation is required. The loss of soil can be completely reversed by the addition of clean soil. However, remediation of the contaminated soils may lead to open excavated areas. The extent of soil removal coupled with the already impacted nature of the area does not warrant the implementation of mitigation measures. To cover these areas with soil would entail removal of soil from some other (probably not impacted) area and may therefore constitute loss of valuable soil resources. Soil erosion is a minimum in the area owing to the nature of the soils and the extent of the area development. Areas that require a substantial amount of excavation, and pose a safety hazard as a result, can be backfilled with stones or soil.

Nature: Loss of soil due to removal during remediation of asbestos contaminated soil		
	Without mitigation	**With mitigation**
Extent	local (1)	local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Small (0)	Small (0)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (12)**	**low (12)**
Status	positive	positive
Reversibility	Yes	Not applicable

Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » If necessary, backfill areas which have undergone a substantial amount of excavation with stones or soil.		
Cumulative impacts: None		
Residual Impacts: None		

- **Generation of waste (general and hazardous waste) during the clean-up**

Apart from the asbestos waste and asbestos contaminated soil, other waste may be generated by the asbestos clean-up activities, including the following:

» Hazardous waste:

- Asbestos contaminated PPE that will be discarded will become hazardous waste, and if disposed incorrectly on the site or surrounding areas may pose health risk to people who come into contact with the waste.
- Wastewater will be generated from the decontamination facility where asbestos workers will shower (on a daily basis, until the clean-up is complete). This water will not go into the municipal system and will be collected in receptacles - drums) and will be treated as hazardous waste, and disposed to a hazardous landfill.

» General waste:

- food wrappers
- eating utensils
- paper
- plastic
- used equipment

General waste can be disposed to a general landfill by the asbestos workers to avoid cross contamination with general waste from the daily operations at the active landfills. If general waste is dumped in the surrounding area, it may impact the environment and people around there, by creating a breeding ground for pests and disease. If hazardous waste is incorrectly disposed of into the surrounding environment (onto uncontaminated soil, which then can result in the release of asbestos fibers into the air), this will create an exposure route for asbestos related disease and could pose health risks to people in the vicinity of the waste. With proper general and hazardous waste

disposal, the impacts of the general and hazardous waste that is generated by the disposal and clean-up can be avoided.

Nature: Generation of waste (general and hazardous waste) during the clean-up		
	Without mitigation	**With mitigation**
Extent	local (1)	local (1)
Duration	Short (2)	Short (2)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium (36)**	**low (14)**
Status	negative	negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » The asbestos contaminated soil, materials and other hazardous waste (such as used PPE and wastewater) from the asbestos clean-up will be disposed to a hazardous landfill by the asbestos workers or contractor-if need arises. » General waste will be handled by a NEMA licensed waste handler. » Littering on the site (general waste) is prohibited. » Waste receptacles for general waste should occur in designated areas. » General waste should be collected on a daily basis. » Ablution facilities must be provided for the asbestos disposal and clean-up workers. These should be located in a designated area. » Should any spillage of the asbestos waste occur, it must be cleaned-up immediately and the affected areas appropriately remediated.		
Cumulative impacts: None		

- **Creation of job opportunities during the disposal and clean-up process**

The exercise will result in a number of short-term employment opportunities. The number of staff required will be informed by the scope of work. Therefore, short term job creation will be a minor positive socio-economic impact.

Nature: Creation of job opportunities during the asbestos clean-up		
	Without mitigation	**With mitigation**
Extent	local (1)	local (1)
Duration	Short (2)	Short (2)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (36)**	**Low (28)**
Status	positive	positive
Reversibility	Not Applicable	Not Applicable
Irreplaceable loss of resources?	Not Applicable	Not Applicable

Can impacts be mitigated?	Yes	
Mitigation: » If semi-skilled and specialist asbestos workers are available in the nearest communities, they should be utilized for the asbestos disposal and clean-up		
Cumulative impacts: None		

- **Long –term positive impact on environment due to the Disposal and clean up**

The removal of asbestos waste visible on the surface of the premises will reduce the future health risk for any of premises employees or people who operate or reside near the premises. The completion of the disposal process will be seen as having a positive impact on the environment (air and soil) and social (premises employees and nearby residents) elements. This is mainly due to the risk of asbestos occurring in the air being reduced to low risk or eliminated altogether and as a result a low risk or elimination of risk of asbestos-related diseases. Therefore, the long-term impact of removal of asbestos from the premises premise is viewed in a positive light (or as a positive action / impact) in terms of the site's duty of care towards the environment and their social responsibility to remedy contamination due to the presence of asbestos and to prevent any further negative environmental (soil and air) or social impacts.

Nature: The main potential environmental impacts of asbestos disposal and clean up		
	Without mitigation	**With mitigation**
Extent	local (1)	local (1)
Duration	Short (2)	Short (2)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (36)**	**Low (28)**
Status	positive	positive
Reversibility	Not Applicable	Not Applicable
Irreplaceable loss of resources?	Not Applicable	Not Applicable
Can impacts be mitigated?	Yes	
Enhancement Measures: »After the disposal and clean-up the premises management should continue with the declaration of the remedied sites as "convenant sites" and limit future use of these areas. » These sites should have clear signage that is maintained on an annual basis. » If there is a re-surface of asbestos on the premises area, it should be reported to premises management, to initiate remedial activities » After the remedial activities, it is recommended that test soil samples and air quality samples of the cleaned areas should be taken at least one year after completion of		

remedial activities, and the results compiled into a report for submission to NEMA such that they can confirm the success of the remedial activities.
Cumulative impacts: The potential asbestos clean-up at the premises is seen as a cumulative positive impact on the soil, air and reduction in the health risk to the employees.

- **Impact on water during asbestos disposal and clean up**

There is no water resource in the immediate vicinity of the proposed disposal site.

10.1 ENVIRONMENTAL MANAGEMENT PLAN

Management Aspect	Mitigation measures	Time frame	Responsibility	Cost (Kshs)	Remarks
General Conditions	• Notify workers about the upcoming activity • Prepare appropriate PPE complying with international good practise • Post appropriate signpost of the site that will inform the workers of key rules and regulations to follow	During preparation for the proposed activity	Manager	60,000	This will help prepare the workers for the asbestos disposal and cleaning process
Waste Management	• Inform cleaning and disposal workers of their responsibilities in terms of the EMP. • Ensure that all waste removal workers comply with the Waste Mgt Regulations of 2006 and National Guidelines for Safe management, and disposal of Asbestos. • Collect waste paper generated at the work site in scrap paper bins. Notify the waste paper removal worker /contractor when the temporary scrap paper storage area reaches capacity, for removal of the scrap paper to a recycling facility. • Place all general / domestic waste in refuse bins.	During the cleaning and disposal process	Manager	70,000	To ensure a clean and healthy environment
Asbestos management	• Asbestos disposal site shall be marked clearly as hazardous material in accordance with the Asbestos National Guidelines • The asbestos will be appropriately contained and sealed to minimize exposure	Preparation and disposal of the asbestos	Manager	250,000	To prevent asbestos dust from becoming airborne; To minimize personal exposure to asbestos fibers

	• The asbestos prior to removal should be treated with a wetting agent to minimize asbestos dust • Asbestos shall be handled and disposed by skilled & experienced professionals • If asbestos material is being stored temporarily, the wastes should be securely enclosed inside closed containments and marked appropriately. Security measures will be taken against unauthorized removal from the site. • The removed asbestos will not be reused				To ensure good environmental and health status of the facility
Traffic and Pedestrian Safety	• Signposting, warning signs, barriers and traffic diversions: site should be clearly visible and the workers warned of all potential hazards • Provision of safe passages and crossings for pedestrians be made • Active management by trained and visible staff at the site, if required for safe and convenient passage for the workers. • Ensuring safe and continuous access to office facilities, shops and residences during disposal and cleaning activities, if the facility is in operation during this activity	At preparation stages	Manager	80,000	To avoid the spread of asbestos dust To reduce the potential to contaminate, as asbestos fibers can be spread through various mediums including living persons To eliminate risks of exposure to asbestos fibers
Air Quality	• Establish air quality monitoring systems and implement operational management plans to ensure that the system is being maintained properly and that the outputs of the monitoring	At preparation and disposal stages of the disposal	Manager	200,000	To minimize air pollution To prevent asbestos fibers from being airborne

	system are providing suitable data on air quality. • Appoint a dust monitoring system to monitor and analyse dust and air quality • Air monitoring should be done continuously in areas related to asbestos removal works.				
Storm water Management	Ensure all storm water from the site is directed towards the established water drains	During disposal process	Manager	20,000	To ensure that there is no ponding on the disposal site or flowing water
Management of temporary waste storage sites	• Ensure management of temporary waste storage sites is in line set procedures and legal requirements. • Register and monitor waste volumes at the temporary waste storage site • Oversee the physical removal of the waste from the temporary waste storage sites	During preparation and disposal stages	Manager	80,000	To ensure that the wastes are removed effectively and in time
Affected flora and fauna	Preserve as possible indigenous trees and other surrounding vegetation that need not be removed Plant additional trees at site boundary	During preparation and disposal stages	Manager	20,000	To ensure environmental management and proper ecological balance
Information and training	Training on the potential health risk caused by exposure to asbestos and how to reduce these risks	Before the disposal process commences	Manager	40,000	To provide awareness on the risks of asbestos
Asbestos exposure	The company shall not permit any person to work in an environment in which he or she would be exposed to asbestos in excess of the prescribed occupational exposure limit.	At, during and after the disposal and cleaning process	Manager	80,000 (Air quality monitoring)	To minimise risks of contracting diseases associated with exposure to asbestos fibers, e.g. cancer

Medical surveillance	Ensure medical surveillance of an occupational medical practitioner after the disposal exercise	After the disposal exercise	Manager	100,0000	To minimize incidents of occurrence of occupational diseases, notably those caused by exposure to asbestos fibers
Cleanliness of premises and plant	workplaces are maintained in a clean state and are free of asbestos waste	After the disposal process	Manager	40,000	To eliminate workplace contamination
Disposal Scheduling and Hours	The disposal and cleaning activities should be limited from 7 am or sunrise (whichever is later) to 5 pm or sunset	During the disposal and cleaning exercise	Manager		To prevent risk of inhaling asbestos fibers, which is possible if one does not clearly see the area of work due to darkness
Clearance Inspections	Inspections should be done to ensure that temporary storage site is cleaned to a satisfaction standard.	After the cleaning work	Manager	50,000	To eliminate risk of future contamination and exposure to asbestos

11.0 Summary of Impacts and their mitigation measures

Possible Impact	Mitigation Measures
Destruction to Flora and Fauna	➢ In an effort to preserve the existing biodiversity, naturally occurring plants should be harvested during the site clearing phase and relocated to a nursery, to serve as a source of plants for replanting at a later date. ➢ Demarcate and delineate areas to be affected by the construction work. ➢ Conduct site clearing activities in stages to minimize the area of exposed soil. ➢ Control earthworks ➢ Install drainage structures properly ➢ It is important to note that there is no threated species of flora and fauna
Water quality degradation	➢ The asbestos shall be disposed in underground concrete confinement of 130mm thick. ➢ The maximum depth of the pit will be 9.5m. this will be more than 10m above water table, compared to 1m allowance recommended in the asbestos management guideline. ➢ Surface water from road, wash down and operational areas shall be directed to sediment traps then sock drains, the filter membrane, to the flash tank and finally to the settling ponds. ➢ The proponent shall install water quality monitoring device. ➢ Asbestos is insoluble in water and alkali and as such cannot leach.
Airborne and water contamination due to Seismic events	➢ The concrete underground wall shall be constructed to withstand the seismic events. ➢ The area has not experienced seismic events in the recent past.
Fire Safety	➢ The proponent shall install firefighting devices at strategic areas. ➢ There proponent shall have fire management plan for the area. ➢ The staff shall be trained on firefighting skill.
Health and Safety Risk	➢ Inform all the relevant stakeholder and government officials prior to commencement of any work. ➢ All employees will wear protective clothing during the exercise. ➢ Provision of respirators to all persons entering the asbestos sites. ➢ Fence off the site to avoid unauthorized access. ➢ Warning & Safety signage will be placed at the strategic areas within the disposal site. ➢ All personnel involved with the asbestos disposal process will be subjected to medical surveillance. ➢ The area currently used for stockpiling of excavated material shall be lined with impermeable material. ➢ All machinery involved in an asbestos disposal process will be jet-washed prior to leaving site. ➢ Asbestos air sampling will be conducted on the sites for clean-up ➢ When there is a visible dust or winds in excess of 20 knots, any asbestos disposal and cleaning process will be stopped. ➢ Thorough, complete and up to date records should be kept of at the site. ➢ Ensure all asbestos is collected and loaded into a transportation vehicle licensed by NEMA ➢ The transporting vessel shall be labelled *'HAZARDOUS WASTE'* ➢ The proponent will follow laid down procedure for handling hazardous substances as per the waste management regulation of 2006 ➢ A first Aid kit must be provided onsite ➢ Employees must be trained on first aid issuance

	➢ There must be a health and safety plan that is kept onsite which must contain appropriate safety measures.
Loss of heritage site	➢ There is no cultural site in this site.
Soil Erosion	➢ Ensure progressive rehabilitation of the site by planting local native trees. ➢ Upon permanent closure of the site, the will be initially covered to a depth of one meter beneath the final land surface. ➢ The proponent should consider backfilling areas which have undergone a substantial amount of excavation with stones/murram or soil.
Dust Pollution	➢ First 25m of access to the entrance to be sealed. ➢ Vehicle speeds on the access road will be limited to 10km/h to minimize the possibility of wheel generated dust. ➢ A wash down area will be provided for all trucks and vehicles leaving the site. The Unloading area with drainage and treatment of water. ➢ Site jet system to be established to allow adequate wetting of operation surfaces.
Unregulated access to the site	➢ The site will be secured by a 2m high fence and entrance to be locked when not in operation. ➢ Signage will be place at the entrance and along the access road to indicate speed limits and risk, OH&S entry obligations and emergency contact details. ➢ Full time surveillance to be installed.
Deposition of unauthorized waste (asbestos)	➢ All Asbestos Containing Materials (ACM) will be recoded on the plan with GPS coordinates indicating their origin for future tracking. ➢ All operation personnel will be trained in proper management of ACM and emergency response procedure. ➢ All deliveries to the site to be registered in NEMA tracking document system. ➢ Confirmation of material properties prior to disposal. ➢ Rejection of materials that are not classified for disposal in the site.
Waste generation	➢ Inform cleaning and disposal workers of their responsibilities in terms of the EMP. ➢ Ensure that all waste removal workers comply with the Waste Regulations of 2006. ➢ Collect waste paper generated at the work site in scrap paper bins. Notify the waste paper removal worker /contractor when the temporary scrap paper storage area reaches capacity, for removal of the scrap paper to a recycling facility. ➢ Place all general / domestic waste in refuse bins

12.0 PROJECT DECOMMISSIONING

In the event that the proposed disposal site lifetime is limited as a result of any unforeseen factors, then at some point, the asbestos containing site must be decommissioned or redeveloped to keep up with changes in land use and legislation on environmental impact.

An initial site assessment will have to be undertaken before an acquisition is made and a change of site usage is proposed. Environmental assessment is a key part of the due diligence process and ensuring that all surveys and assessments identify potential decommissioning hazards and risks and how to conserve resources and reduce the instances of environmental liability. In extreme situations, the decommissioning process may involve the safe handling and disposal of hazardous asbestos, material and waste and the cleanup of a site that has been contaminated by previous disposal operations.

Exposure to asbestos may be fatal: the fibers can lodge in the lungs, thus causing the onset of a number of types of lung cancer. This may be prevented if suitable protective clothing is worn. The site may carry more risks through the decommissioning process. The cost of the decommissioning process may be high, but the safety implications of contamination are so severe that each step of the process needs to be planned and executed to perfection.

Ultimately, the purpose of decommissioning of the site will be to reclaim the land, making it safe for people and vegetation. The introduction of vegetation to the site is less likely to have any severe impact. Environmental impact assessment will ensure that environmentally responsible decommissioning and redevelopment is a priority and that introduction of right vegetative species offsets any damage that may have been previously caused. The regeneration of this site will aim at protecting the health of the people that work on or are near the site and provide protection for the land for any other future developments with minimal negative impact.

13.0 CONCLUSIONS

As a result of the current potential health risk posed by the presence of the asbestos waste at HAZE CONNECT LIMITED premises and the long period of time that the asbestos has been present at the temporary site, it is recommended that the license and authorization for the potential asbestos disposal and clean-up at the proposed site within the premises be granted by NEMA, subject to the a specific mitigation measures contained in this report and the EMP, when handling and disposing of asbestos waste. The presence of asbestos at the current site within the premises grounds poses a long term environmental and human health risk to people who operate on the site, and therefore the need and urgency to undertake the disposal and clean-up in order to eliminate any further environmental risks at contaminated area within the premises is imperative. It is therefore recommended that the asbestos disposal and clean-up be undertaken by the premises management as a matter of urgency to avoid or reduce any future health risks to workers and people that operate at the premises.

14.0 NON-TECHNICAL SUMMARY

This Environmental Impact Assessment was conducted to determine the overall environmental impacts that the proposed asbestos roofing sheet disposal and subsequent clean up exercise is likely to have in the future. HAZE CONNECT LIMITED. Believes that investing in environmental management is a worthwhile venture and has greater plans for land management for sustainable environmental undertakings during its activities at this site.

After consideration of all the environmental impacts that the proposed activity may cause, including public health risks; impact on soil, air and water; waste management issues; short and long term positive impacts, various mitigation measures are proposed. These measures are contained in the Environment Management Plan (EMP) and include the following: -

- Practising good waste management
- Control of asbestos fibre release and exposure effects
- Monitoring air and soil quality
- Medical surveillance
- Health and safety considerations

The proposed activity can be a sustainable development if all the mitigation measures advanced herein are adhered to.

15.0 REFERENCES

Administrative Staff College of India, Hyderabad, 2009, EIA Guidance Manual – Asbestos based industries, India.

ICF Incorporated 1989, Regulatory Impact Analysis of Controls on Asbestos and Asbestos Products, Fairfax Virginia, USA.

Kenya Gazette, No. 8 of 1999, The environmental Management and Co-ordination Act, 1999, Government Press, Nairobi, Kenya, 175pp

UNEP (2011) Decoupling natural resource use and environmental impacts from economic growth, A Report of the Working Group on Decoupling to the International Resource Panel. Fischer-Kowalski, M., Swilling, M., von Weizsäcker, E.U., Ren, Y.,Moriguchi, Y., Crane, W., Krausmann, F., Eisenmenger, N., Giljum, S., Hennicke, P., Romero Lankao, P., Siriban Manalang, A., Sewerin, S. UNEP (Industry and Environment), UNIDO, IFA: Environmental Management Systems, Technical Report No. 26 part 2, Paris France 1998

CALVIN OMONDI

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PROFESSIONAL SUMMARY

Mr Calvin is an Environmental and Social Safeguards Specialist with cumulative 7 year experience in Environmental and Social management services. Mr Calvin has vast knowledge and experience in monitoring of projects supported by AfDB, World Bank, IFC, EIB, KfW, and JICA. Mr Calvin is currently undertaking Masters in Environmental Science from Jomo Kenyatta University of Agriculture and Technology. He is a registered Associate Expert by the National Environmental Management Authority-NEMA in Kenya Reg No. 12242. He is equipped and well conversant with Environmental and Social Safeguard Standards on development projects from multilateral financiers and proponents.

Calvin has worked as an associate Environmental and Social Safeguards consultant in the implementation of a national project by the Ministry of Education, State Department of Technical and Vocational Education in Kenya. Additionally, Mr Calvin has successfully offered Technical Support to the implementation of a national project implemented across all the 47 counties, funded by the world bank in the capacity of a Technical consultant in Environmental and Social Safeguards for the project. His most recent experience, includes providing leadership in the comprehensive Environmental and Social Impact Assessment Study for the proposed infrastructural developments in 23 counties of Kenya, for the Ministry of Education.

Mr Calvin has actively participated in the Global Youth Environmental Assembly as an Environmental Policy and Human Rights Defender. At the United Nations Environmental Program, Mr Calvin is an accredited associate in the Youth Major Group of Environmental Champions where he specifically volunteers to develop policies for global adoption and practice. He has recently contributed to the draft concept note on Environment Policy vis-a-vis science in the just ended United Nations Environmental Assembly (UNEA-6) with the United Nations.

Mr Calvin has equally been involved in the Environmental Impact Assessment study of proposed residential, commercial, processing and manufacturing developments for private clients for the last 7 years. Moreover, Mr Calvin is a practitioner in OSHA for a number of private clients for the same number of years. Mr Calvin has also volunteered to engage in Climate Change, carbon crediting, and waste management issues for Nairobi County as a service leaner.

Finally, he is well acquainted with both national and international Environmental Laws and Conventions. He is equally a design thinker with immense problem-solving skills, and good organizational, analytical, and research, presentation and communication skills. He upholds integrity and professionalism in being part of the solutions to achieving good and desired results.

Mr Calvin is fluent in English, Kiswahili, and French languages.

WORK EXPERIENCE

08/2023- PRESENT
ASSOCIATE CONSULTANT: ENVIRONMENTAL AND SOCIAL SAFEGUARDS-
ESCIP-ENVIRONMNENTAL SUSTAINABILITY & CONSERVATION IMPROVEMENT PROGRAM-World Bank_Kenya

- Support stakeholders, project preparation and implementation teams in the design and implementation of E&S risk management aspects.
- Support Project teams in monitoring and reporting on the implementation of environmental and social risk matrix
- Support Project teams in monitoring and reporting on indicators in the Project E&S risk management instruments;
- Support the Project teams in ensuring that appropriate E&S instruments and tools are applied by all contractors
- Provide technical support in the overall implementation of the agreed site specific ESMP into the

implementation matrix

- Support the Project teams in ensuring that appropriate environmental and social mitigation measures are proposed and met;
- Provide technical leadership into the AfDB's Environmental and safeguards policies and standards
- Assist the Project teams in compiling reports on E&S impacts, and mitigation measures, as per Project E&S instruments;
- Supervise the key deliveries into periodic Environmental and Social Risk Audit at key stages of the projects implementation.
- Assist Project preparation teams in the design and implementation of stakeholder consultations and the preparation of other E&S risk management instruments, such as Environmental and Social Management Frameworks (ESMF), Environmental and Social Management Plans (ESMP).

1/2023- 12/2023

INDEPENDENT CONSULTANT: ENVIRONMENTAL AND SOCIAL SAFEGUARDS-

WATER SECTOR TRUST FUND-World Bank KENYA

- Conduct assessments to identify potential environmental, social, and governance risks associated with water networks within the metropolis.
- Develop strategies and mitigation measures to manage and minimize these risks throughout the project lifecycle.
- Engage with a diverse range of stakeholders, including government agencies, local communities, NGOs, and project partners, to address concerns, gather feedback, and build consensus around safeguard measures and project objectives.
- Provide training and capacity building support to project staff, implementing agencies, and local stakeholders on ESG policies, procedures, and best practices.
- Monitor project activities to ensure compliance with ES standards and regulations. Develop monitoring frameworks and tools to track progress, assess impacts, and evaluate the effectiveness of safeguard measures.
- Prepare reports and documentation on ES compliance for internal use, funders, regulatory authorities, and other stakeholders.
- Coordinate with internal departments, project teams, external consultants, and relevant stakeholders to ensure alignment and integration of safeguard requirements into project planning, implementation, and monitoring processes.
- Identify lessons learned and best practices from project experiences to improve safeguard policies, procedures, and implementation approaches.
- Uphold high ethical standards and promote transparency, accountability, and integrity in all safeguard-related activities and interactions.
- Address cross-cutting issues such as gender equality, human rights, climate change, and biodiversity conservation within the context of safeguard assessments and mitigation strategies.

1/2023- 12/2023

PROJECT CONSULTANT: ENVIRONMENTAL AND SOCIAL SAFEGUARDS-

TECHNICAL VOCATIONAL EDUCATION AND TRAINING PROJECT-AfDB_KENYA

- Monitoring Safety, and security of the surrounding communities and establish preventive and control measures consistent with the agreed ESMP.
- Provide technical expertise on safeguards issues on behalf of the Ministry of Education.
- Provide leadership and coordination of the field supervisors assigned to the various units.
- Reviewing documentation about environmental and social compliance (including weekly project progress reports, Environment, and social reports, grievance logs, incidents, and accidents logs) during project implementation;
- Assessing if the grievance redress mechanisms established for the project are functioning appropriately and the individual projects are implemented in an environmentally and socially sustainable manner.
- Conducting comprehensive Monitoring and Evaluation of the projects deliverables including advising on the procurement and budget best practices.
- Ensuring adherence to the infection prevention and control measures by the contractors as guided by the Ministry of Health/ AfDB guidance note on managing COVID-19 in ongoing Bank financed civil works on project sites.
- Contributing to project progress reports about the overall implementation of environmental and social requirements of the project.
- Preparing and submitting National monthly, and quarterly reports on ESHS.

5/2022- 12/2023

PROJECT OFFICER-ENVIRONMENTAL AND SOCIAL SAFEGUARDS- SECONDARY EDUCATION QUALITY IMPROVEMENT PROJECT- World Bank Kenya

- Monitoring Safety, and security of the surrounding communities and establish preventive and control measures consistent with the agreed ESMP.
- Carrying out awareness/sensitization, including stakeholder engagement and consultation for HIV/AIDs awareness, sexually transmitted infections, Gender- based Violence (GBV), and Sexual Exploitation and Abuse.
- Reviewing documentation about environmental and social compliance (including weekly project progress reports, Environment, and social reports, grievance logs, incidents, and accidents logs) during project implementation;
- Conducting comprehensive Monitoring and Evaluation of the project's deliverables including advising on the procurement and budget best practices.
- Identifying issues to be addressed through the safeguards' instruments under the project within the context of COVID-19 Pandemic guidelines, Child protection guidelines and review the issues with the contractors.
- Ensuring adherence to the infection prevention and control measures by the contractors as guided by the Ministry of Health/ World Bank guidance note on managing COVID-19 in ongoing Bank financed civil works on project sites.
- Contributing to project progress reports about the overall implementation of environmental and social requirements of the project.
- Capacity Needs assessment for 24 Counties in Kenya with regard to the implementation of SEQIP project for World Bank project concept appraisal. The assessment involved assessing the Capacity and Performance of target schools with regards to the available sanitary and infrastructural development units. Systems.
- Preparation of environment safeguards input to Aide Memoir for the Technical Assessment and Allocation committee of the project.
- Full participation from the preparation of project concept note to the implementation of the comprehensive needs assessment, restructuring of the project and review of the required safeguard instruments, for the proposed infrastructural development in Kenya.
- Technical review (environment Safeguard) for project Environment and Social Impact Assessment and Environment Audits for projects as assigned by in Country Senior Safeguard Specialist / TTL and safeguards trainings to the client staffs.
- Preparation of environment safeguards input to Aide Memoir for Ministry of Education Kenya, State Department of Basic and Early Learning
- Project Brief and Environment and Social Management Plan (ESMP) for Proposed Improvement of infrastructure in the targeted schools and institution of learning in Kenya.
- Preparation of Project Brief and Environment and Social Management and Monitoring Plan for Improvement project for the entire region

01/2021 – 04/2022

ENVIRONMENTAL AND SOCIAL SERVICES OFFICER- TINGORI CONSULTANCY LIMITED

- Reviewing of ESIA reports
- Organizing and participating in CSR activities
- Supervising Key and Non-key experts in their delivery of ESIAs, RAPs, and VMPGs
- Overseeing the delivery of the company's projects
- Preparing required assessment tools for any assignment
- Ensuring compliance with the client's needs
- Organizing Desktop study and literature reviews
- Documenting progress reports and report to the team leader daily
- Organizing Public Participation forums
- Developing and submitting EoI's on Environmental and Social openings.

01/2019 – PRESENT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT /AUDIT CONSULTANT- FOR 30 Clients

- Conducting Environmental and Social Impact Assessment studies to private clients
- Conduct Environmental Audits for private clients
- Conduct Resettlement Action Plans (RAP) for private clients
- Conduct Vulnerable and Marginalized People Groups (VMPG) Assessments and frameworks of implementation

for private clients

- Help clients acquire NEMA license to facilitate their development projects
- Assist clients to execute improvement orders from NEMA as required.
- Advice clients on best practices in undertaking their proposed developments
- Act as community liaison person between the client and the community in view of proposed developments
- Facilitate Land Use Change and PLUPA for individual Clients
- Act as liaison between NEMA and the Clients in the implementation and planning of proposed development projects.

05/2019 – 08/2019

VOLUNTEER: COMMUNITY SUSTAINABLE HEALTH AND ENVIRONMENTAL PROGRAM (CSHEP)

- Conducting training on Bio-intensive agriculture to small farmer groups in the community
- Conducting farm inspections to ensure best practices and compliance are adhered to
- Documenting monthly reports on the compliance and default indicators of organic farming
- Engaging schools in Environmental Health Conservation mechanisms
- Pilot programs for the establishment and support of environmental clubs in 289 primary schools, 125 secondary schools and 54 colleges in Kajiado County.
- Supporting technical leadership to small economic empowerment groups on environmental and social best practices in the agricultural sector.

01/2018 – 09/2021

PROJECT'S ENVIRONMENTAL AND SOCIAL SAFEGUARDS OFFICER - RAFIKI WA MAENDELEO TRUST

- Ensuring that projects comply with environmental laws, regulations, and standards. This involves assessing potential environmental impacts, implementing measures to mitigate negative impacts, and monitoring compliance.
- Addressing social concerns and impacts associated with the project, such as community displacement, cultural heritage preservation, and social equity by conducting social impact assessments, consulting with affected communities, and developing strategies to address social risks and enhance benefits.
- Developing and implementing environmental and social safeguard policies and procedures for project planning, implementation, and monitoring.
- Identifying potential environmental and social risks associated with project activities and developing strategies to manage and mitigate these risks.
- Conducting risk assessments, establishing risk management plans, and implementing measures to minimize adverse impacts.
- Engaging with a wide range of stakeholders, including government agencies, local communities, non-governmental organizations (NGOs), and project partners, to address environmental and social concerns, gather feedback, and build consensus around project objectives and strategies.
- Providing training and capacity building support to project staff, implementing agencies, and local stakeholders on environmental and social safeguard policies, procedures, and best practices.
- Monitoring project activities to ensure compliance with environmental and social safeguard requirements and conducting periodic evaluations to assess the effectiveness of mitigation measures and identify areas for improvement.
- Preparing reports and documentation on environmental and social safeguard compliance for project stakeholders, funders, and regulatory authorities. This may include environmental impact assessments, social management plans, monitoring reports, and compliance certificates.

EDUCATION

2022- Present: MSc IN ENVIRONMENTAL SCIENCE, JOMO KENYATTA UNIVERSITY OF AGRICULTUR AND TECHNOLOGY

Ongoing

2014- 2017: BSC ENVIRONMENTAL SCIENCE, JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY

SECOND CLASS HONORS UPPER DIVISION

1/2019- 12/2021: DIPLOMA IN SOCIAL WORK AND COMMUNITY DEVELOPMENT, KENYA INSTITUTE OF MANAGEMENT

2010- 2013: KENYA CERTIFICATE OF SECONDARY EDUCATION, CHIANDA HIGH SCHOOL AGP: 74 POINTS GRADE: B+

PROFESSIONAL MEMBERSHIP AND LICENCING

- NEMA- National Environmental Management Authority. Associate Expert Reg No. 12242
- Environmental Institute of Kenya
- Institute of Workplace Professionals in Kenya Reg No. 13456
- Global Youth Environment Associate-United Nations Environmental Program

WORKSHOPS AND TRAINING

1. Environmental and Social Framework (ESF) Training for Environnemental and Social Specialist in
2. Preparation of the Integrated Safeguards Data Sheet (ISDS)
3. Enhancement of Environmental and Social Monitoring and evaluation tools for management
4. Environmental and Social Framework (ESF) e-learning for Environmental & Social Specialists
5. Access to Information eLearning for multilateral financing institutions on development projects
6. Certificate of achievement in Sociology, University of Western Sydney, Australia, 2022 (On-line)
7. Grievance Redress Mechanism in Projects

REFEREES

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FORM S (r.14(4))

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY (NEMA)
THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT

CERTIFICATE OF REGISTRATION AS AN ENVIRONMENTAL IMPACT ASSESSMENT/ AUDIT EXPERT

Certificate No: NEMA/EIA/RC/6024

Application Reference No: NEMA/EIA/ER/12745

This is to certify M/s **CALVIN OMONDI OGEMBO** of

P.O. Box 65861 - 00607, NAIROBI (Address) has been registered as an Environmental Impact Assessment Expert in accordance with the provisions of the Environmental Management and Coordination Act Cap 387 and is authorized to practice in the capacity of a Lead Expert/Associate Expert/Firm of Experts (Type) **Associate Expert**

Expert Registration No: **12242**

Issued Date : **8/26/2021**

Signature

(Seal)

Director-General
The National Environmental Management Authority

P.T.O.

ISO 9001:2015 Certified

CURRICULUM VITAE

1. **Family Name:** ABUYAH
2. **First Names:** ACHIENG ALICE
3. **Date of birth:** 5th September 1984
4. **Nationality:** KENYAN
5. **Email:** abuyah84@gmail.com
6. **Mobile:** +254720110382, +254739110382
7. **Education:**

Institution	Degree Obtained
Maseno University	Masters of Public Health
Moi University	Bachelors of Arts in Social Studies- Sociology and Community Development
African Nazarene University	Certification on Environmental Impact Assessment and Audit

Alice is a Social Development and Safeguard expert with over 14 years of experience, a holder of post graduate training in Environmental Impact assessment, Master's degree in Public Health and Bachelors of Arts degree in Sociology and Community Development. She has good knowledge, understanding and experience in Project Management, feasibility and needs assessment studies, Environmental and Social Impact Assessments, preparation of RPF, ESMF, VMGF, SEP and LRP implementing safeguard policies and this has helped projects not to detrimentally influence the social and environmental well-being of the population.

I have experience conducting, preparing, and monitoring of ESIA, VMGP, RAP for a variety of building and construction, infrastructure including road, water and sanitation (water and sewer pipeline extensions, dams), energy projects (wind, solar, Minigrids, transmission lines) in the region. This positions me in identifying, predicting, evaluating, mitigating and monitoring the biophysical and socio-economic impacts for new and existing developments.

I am registered and licensed to practice as a Lead expert in Environmental and Social Impact Assessment and Environmental audits studies by NEMA. My professional application has majorly covered the fields of project planning, socio economic surveys, gender mainstreaming and action planning, Social and Environmental screening, Grievance Redress Mechanism, Gender Based Violence, Social risk and due diligence, Social Mitigation and management plans, social risk management frameworks, Stakeholder engagements, community mobilization and sensitization, Capacity building and training, and various scopes among other fields. I have knowledge and experience in preparation, review and implementation of social safeguard instruments such as Child Protection Plan, Internal Labour Management Plan, Stakeholder Engagement Plan, Grievance Mechanism Plan, Environmental Health and Safety code of conduct and policy among others and experience conducting monitoring of Environmental and social compliance during construction. Alice has extensive knowledge and experience in safeguards documentation and management for projects and programs supported by the World Bank/IFC, AFD, AfDB among others through his international experience working on development projects across Kenya, Tanzania, Comoros- Madagascar, Burundi, South Sudan. As a sociologist, I consider ethical values as a primary factor of my undertakings.

Key areas of Specialization

1. Environmental and Social Impact Assessment Reports
2. Environmental and Social Safeguard Project Implementation and Monitoring
3. Environmental and Social Governance
4. Environmental and Social Management System
5. Environmental and Social Risk management
6. Resettlement Action Plan
7. Grievance Redress Mechanism

Fields of Competence:

- Familiarization with each of the World Bank's and AfDB Environmental and Social Safeguards standards and policies.
- Preparing and implementing effective Environmental & Social Management Plans as part of the ESIA monitoring of projects
- Address the issues raised by lenders in the Environmental and Social Due Diligence (ESDD) reviews from AfDB, AECOM and ERM, WB

- Participate in the preparation, review and implementation of Resettlement Action Plans (RAPs), VMGP in line with World Bank IFC Performance Standards and AfDB Operation Safeguards
- Design and monitor the implementation of the Stakeholder Engagement Plan (SEP) and Grievance Mechanism (GM) in line with Local and International Guidelines by preparation of social risk management plans social risks and impacts related to the project. These include the preparation of VMGPs and RAPs/ARAPs and grievance Redress Mechanism (GRM) in accordance with the VMGF and RPF respectively.
- Preparing training materials and conducting technical training workshops on Environmental and Social Safeguards requirements
- Working closely with the Administration Offices, Community Liaison Officers, (CLOs) in dissemination of Public Information related to the project construction and operation phases.
- Compiling site specific and project area socio-economic baseline data by undertaking Household Survey, Key Informant Interviews etc.
- Supervision and monitoring of the implementation of social instruments-VMG, LMP, SEP and RAPs in accordance with the respective Bank's guidelines and policies,

Professional Experience in preparation, implementation, monitoring-evaluation and audits of E&S assessment instruments

Employer: African Development Bank

Role/Title: Consultant Environment and Social Safeguard Officer

Projects: Road, water, Power and Energy

Description of tasks or roles

The E&S Consultant works under the oversight and guidance of the Director Safeguard and Compliance Department (SNSC), and the direct supervision of the Bank's E&S officer assigned to the project teams,
to act as the permanent technical E&S adviser/support to the task manager/investment officer, the E&S consultant's core duties include the following:

- **Project preparation**: (i) identify the E&S risk category in collaboration with the borrower/client, and then prepare the categorization memorandum (CM); (ii) advise the borrower/client on the required environmental and social (ESA) documents to prepare in accordance to national legislation and the Bank's ISS requirements; (iii) review and clear the ESA documents prepared by the borrower/client; (iv) provide the inputs to the readiness reviews and any other quality assurance requirement; (v) Draft and/or contribute to drafting relevant sections of other required risk notes, PEN, PCN, and Project appraisal reports; (vi) prepare the ESCON; (vii) prepare response to any query related to the E&S aspects including early complaint filed through BCRM. At any stage of the preparation phase, the consultant shall make proposal of mainstreaming environmental sustainability in the project design, whenever feasible.
- **Project implementation**: (i) provide technical clearance on any condition precedent or document prior to commencement of related activity to allow the task manager/investment officer issuance of no-objection to borrower/client; (ii) Review bidding documents and contracts and provide clearance for commencement of works that are subject to E&S completion; (iii) carry out field mission to support and monitor implementation of E&S measures by the project teams; (iv) request and review the quarterly E&S implementation reports from borrower/client; (v) assist and ensure that borrower/client carries out the annual E&S performance audit of project, and then review and clear; (vi) carry out all the tasks required by a Mandated Lead Arranger (MLA) role, when the Bank is on that role; (vii) participate in transaction meetings/conference calls involving external E&S advisors and E&S specialists from sponsors and other lenders; (viii) prepare the management response to external players' complaints or internal audits and spots checks carried out by internal stakeholders, related to projects he/she is assigned to.
- **Project completion report**: (i) gather and analyse information on project E&S performance; (ii) provide inputs to the evaluation.
- **Project Documentation**: The Consultant shall be expected to make review/clearance, written contributions, advice, and field visits. The deliverables are: Categorization memorandum; Timely review and clearance of ESA documents (Business standards 3-4 refer); Timely inputs draft documents and quality assurance review documents; Back-to-Office reports and/or aide-memoires; Reports/templates prepared and shared with sponsors and co-financiers; and Management responses to E&S complaints/audits/reviews

Name of the Project	**South Sudan - Engineering, Procurement and Construction (EPC) and Financing of Upgrading of the Bor – Pibor – Okello – Pochalla – Boma Road (350 km) and Pochalla – Akobo – Waat – Ayod Road (190km) and Akobo – Jikmir (40km) Road to Paved (Asphalt) Standard & Construction of 2 bridges on Sobat River**
Date	February 2023- to Date
Country	South Sudan
Employer/Client	Ministry of Roads and Bridges of the Republic of South Sudan-
Financier	Republic of South Sudan

Role	Environment and Social Safeguard Consultant – Team leader
Description of Tasks	Preparation of the Safeguards Instruments for the 580km road Sector Project including the following: • Preparation of the Final Environment and Social Management Framework, • Technical review, updating of the Labour Management Procedure (LMP), • Advise the client on the required Environmental and Social documents to prepare in accordance with the national legislation of South Sudan • Review the ESS documents from the consultant. • Prepare a response mechanism to all query's related to Environment and Social aspects of the project • Identify the Environment and Social risk category for the project Leading to the development of the following documents: • TOR for Gender Based Violence Action Plan (GBV) • TOR for security risk assessment (SRA), • TOR for Sectoral Environmental and Social Impact Assessment (SESIA) • TOR for Capacity Building Plan with activities, timetable and budget, • Environmental and Social Risks and Impact Assessment for the SESRP, • Stakeholder Engagement Plan for SESRP, • An Environmental and Social commitment plan (ESCP) that will elaborate the above aspects including on hiring, capacity Building Plan, Project, and Sub project level Instruments to be prepared and address the following issues. • Monthly Monitoring Reports of the Environmental and Social Safeguards for the Implementation of the project of Upgrading and response under the Ministry of Roads and bridges in South Sudan. • Social Assessment Report for the Proposed South Sudan Community Social responsibility programme. • Write up of Sustainability Plan for South Sudan Road for upgrading Project (EPC) for Additional Financing IV • Write up of Risk Management Plan for South Sudan for upgrading Project (EPC) for Additional Financing IV • Write up of Climate Change Management Plan South Sudan for upgrading Project (EPC) for Additional Financing IV

Name of the Project	**FINANCING LOCALLY-LED CLIMATE ACTION (FLLoCA) PROGRAM**
Date	October 2021-December 2021
Country	Kenya
Employer	**THE NATIONAL TREASURY AND PLANNING**
Financier	**World bank**
Role	**DEVELOPMENT OF ENVIRONMENTAL AND SOCIAL RISKS MANUAL (ESRM)**
Description of Tasks	Together with the Environmental Specialist • Develop Contractor's Environmental and Social Management Plan and associated plans such as Waste Management Plans and Occupational, Health and Safety Plans, Stakeholder engagement plan, |Child protection strategy, gender-based Violence and Sexual harassment Action Plan among other plans and procedures and determine their adequacy and level of implementation; • Assisted on developing Environment and Social Risk (E&S) screening tools and the process of planned activity to be adopted prior to the commencement of the proposed activity to help determine whether; Summary Project Report (SPR), Comprehensive Project Report (CPR) or Full Environment and Social Impact Assessment (ESIA), or A stand-alone Environment and Social Monitoring Plan (ESMP) and Resettlements Action Plans (RAPs) review and approval by NEMA. • Assisted in development of an elaborate environment and social incident response procedures on Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH)risks related to FLLoCA projects will be assessed and mitigated during project implementation stage. Reporting of incidences to be

	aligned to Environment, and Social Incidents Response Toolkit (ESIRT) developed by the World Bank in 2018. • The Counties under Kenya Devolution Support Project (KDSP) and Kenya Urban Support Project (KUSP) were supported to establish Grievance Mechanism (GM). The County Climate Change Unit (CCCU), together with Ward Implementation Committees implementing FLLoCA activities at the County level will utilize the existing GM structures to address grievances during sub project implementation stage. These steps are; Lodging of Complaints, Receipt and Acknowledgement of Complaints, Documentation of the Complaint, Assessing the Complaint, Action, Investigation, Review/authentication of evidence, responding to/resolving the complaint, Closing the file and Appeal Process • Developed a stakeholder engagement mechanism and plan that will ensure that stakeholder engagements are effective, meaningful and meet the required objectives. Key considerations for stakeholder engagements in pre-implementation phases include; Ongoing and iterative, Differentiated needs and requirements of stakeholders, Equitable and non-discriminatory, Resources and budgeting, Transparent, Prior Information, Respectful and free of intimidation and coercion, Confidentiality, Timing and Documentation. • Developed training and capacity building program that was referenced and enhanced from the Social Risk Management curriculum developed under KDSP in collaboration with Kenya School of Governments (KSG), key aspects of the program include Training on; Introduction to Environment Social Risk Management, Regulatory Frameworks for Environment and SRM, Stakeholder Mapping and Engagement, Environment and Social Impact Assessment (ESIA), Land Acquisition process and Resettlement Action Plan (RAP), Vulnerability and Marginalization, Labor Management, Grievance Redress and Mitigation Strategies, Sexual Exploitation and Abuse SEA and Sexual Harassment triggered by projects, Physical/Land use Planning Safeguards and Occupational Health and Safety Considerations during Project implementation phase, Incidence Reporting (Environment Health and Safety) during project implementation stage and Monitoring, Evaluation and Reporting • Developed Monitoring and evaluation frameworks, tools that are integral requirement for tracking performance of Counties with regard to implementation of Environment and Social risks mitigation measures.

Name of the Project	**Secondary Education Quality Improvement Project (SEQIP)**
Date	2019 to Date
Country	Kenya
Employer	Ministry of Education- State Department of Basic Education
Financier	World Bank
Role	Construction Supervision of the Infrastructures (WASH facilities, Science Laboratories, Classrooms and Dormitories in Schools- 30 Counties, 4400 classrooms Social Safeguard Specialist
Description of Tasks	• This role involved focusing on Gender and Socio-economic equity, preparing internal social guidelines for implementation, monitoring and reporting of social documents required by various safeguards instruments. • Reviewing Social Implementation Plans such as the Vulnerable and Marginalized Groups Plan, Social Assessment Plan and other social safeguards documents to ensure compliance with relevant safeguards policies of the Government of Kenya and the World Bank. • Track the project' compliance with proposed mitigation measures with regard to socio– cultural and environmental aspects-to determine the impact of the SEQIP Project on the wellbeing of the VMGs in all the 30 counties and ensure the free, prior and informed consultations with VMGs to enable their involvement and participation • Preparing training materials, and conducting technical training workshops to MOE and SEQIP Implementation staff as well project implementation agencies on social safeguards requirements, continually monitor the inclusion of VMG and the achievement of gender equality especially in the administration of the scholarships

	and mentorship while liaising with the school-based Gender Champion teacher on modelling and gender-based violence. • Preparation of Social monitoring and evaluation reports and, perform tasks and responsibilities related to the social issues including SEA and SH, GBV, HIV/AIDS program, issues related to labour influx (people coming into the project area for project related work) and child labour • Ensure that the project benefits reach the Vulnerable and marginalized groups, identify, and prepare a comprehensive plan that will avert any potentially adverse effects from project interventions on Vulnerable and Marginalized Groups

Name of the Project	**KENYA SOCIAL ECONOMIC INCLUSION PROJECT(KSEIP)**
Date	2019 -2020
Country	Kenya- 14 Counties
Employer	Ministry of Labour and Social Protection- State Department for Social Protection
Financier	World Bank
Role	**Social Safeguard Expert- KENYA SOCIAL ECONOMIC INCLUSION PROJECT(KSEIP)- CASH TRANSFER AND SAFETY NET PROGRSMME**
Description of Tasks	Roles and Responsibility • To review how the GRM, VMGF, GBV components are considered in the project so far and provide recommendations for the operational manuals and procedures and prepare an action plan for inclusion in the future. • In consultation with VMGs, develop a VMGP which will include but not limited to; 1. Demographic, social, cultural and political characteristics of these groups, 2. Land and territories that they have traditionally owned, customarily used or occupies 3. Natural resources they depend on. 4. Summary of free, prior and informed consultation with the groups that were carried out during project planning and preparation and during project implementation. 5. Potential adverse effect/impacts on the groups from the project and how will they be minimized, mitigated and compensated. 6. Cost estimates and financing plan for mitigation measures on specific characteristics ad needs of locations 7. Culturally appropriate procedures to address grievances by this groups arising from project implementation 8. Mechanisms for monitoring, evaluating and reporting on the implementation of the above measures. • Train the National and County level focal points partners on social safeguard requirements of the project and develop an action plan they will then monitor and support. • A will work closely with the G&CM unit to ensure the social impacts are monitored and mitigated and the GRM is accessible and functional for all social impacts and will work with GBV consultant to develop GBV action plan Implementing the implementing the VMGF is through: • conduct a VMGs screening, • undertake a Social Assessment (OP 4.10, - Social Assessment), • prepare site-specific VMGPs (OP 4.10, - Indigenous Peoples Plan), • implementation and monitoring of VMGPS. • Assessment of the technical capacity of the workers at national, state & county government level with regard to performance of their tasks. • Carrying out Stakeholder Engagement at National level, State level, County level. • Carrying out of field investigation for the selected project area • Preparation of Final Environment and Social Audit Report • Presentation of the Environment and Social Audit (safeguard report) to Client, Project Management Unit and World Bank Mid Term Review Team.

	Specific tasks performed: Verifying the levels of compliance with the ESMF of the KSEIP, the triggered and relevant World Bank Safeguard Policies, and the • Assessing the environment and social management systems and structures put in place for the management of the project at national, state, county, • Examining the environment and social management and monitoring tools and procedures in place for control and corrective actions during the planning, implementation and Operation & maintenance phases of the KSEIP projects; • Identifying the gaps, if any, in terms of capacity development needs established in the project ESMF and the resources (both human and financial) required for its effective implementation. Special emphasis on the capacity development and/or strengthening requirements at State and county levels is expected; • Determining the extent to which positive environment and social benefits of the project have been realized by the stakeholders, community, and the environmental components. Document the lessons learnt; • Examining the records and documentation relating to environment and social impacts, actions taken to manage them and aspects of performance i.e., more specifically to review the reports prepared by the PMU Environment & Social Safeguards consultants of the KSEIP and World Bank Aide Memoires. • An Assessment of any major issues that indicate non-compliance with the ESMF as well as proposed corrective actions to be undertaken. Such an assessment should determine whether adequate measures, in accordance with the ESMF, are taken by stakeholders to ward off any adverse environmental and social impacts (i.e. geo-physical, biological, socio-cultural, human health and safety);

Name of the Project	Construction Supervision of new education complex with laboratories, workshops, classrooms and offices
Date	2016-2018
Country	Kenya- 12 Counties - **Kitui, Kilifi, Wajir, Kakamega, Migori, Homabay, Kericho, Nairobi, Machakos, Nyeri, Siaya and Nandi.**
Employer	Ministry of Education- State department of technical and Vocational Training Institute TVET PHASE 2 and TVET Phase 3
Financier	African Development Bank
Role	Environment and Social Safeguard Specialist for DAMA Services
Description of Tasks	• Collection of socio-economic & environmental data • Analysis of data collected and delineating of baseline • Forecasting on nature and significance of environmental impacts • Identify potential environmental and social impacts that could result from the project • Carry out Environmental, Social and Economic survey using structured questionnaires • Carry out public participation and consultations to inform the stakeholders on the positive and negative impacts of the project • Propose Mitigation Measures to the identified negative environmental and social impacts • Formulation of Environmental and Social Management and Mitigation Plan (ESMMP) and Environmental Monitoring Plan (EMP) • Preparation of Environmental and Social Impact Assessment report • Submission of the reports to NEMA • Development of environmental monitoring indicators • Public disclosure on the NEMA website
Name of the Project	**IMPRESSeD-** Integrated Mechanisms for Poverty Reduction for Sustainable Education & Development
Date	January- 2022- July 2022
Country	Kenya- 12 Counties - **Samburu, Mandera, Wajir, Garissa, Marsabit, Kilifi, Makueni, Bungoma, Siaya, Homa Bay, Machakos and Nairobi.**
Employer	NACONEK- National Council for Nomadic Education in Kenya

Financier	African Development Bank (AfDB)
Role	Environment and Social Safeguard Specialist
Description of Tasks	• Collection of socio-economic & environmental data • Analysis of data collected and delineating of baseline • Forecasting on nature and significance of environmental impacts • Identify potential environmental and social impacts that could result from the project • Carry out Environmental, Social and Economic survey using structured questionnaires • Carry out public participation and consultations to inform the stakeholders on the positive and negative impacts of the project • Propose Mitigation Measures to the identified negative environmental and social impacts • Formulation of Environmental and Social Management and Mitigation Plan (ESMMP) and Environmental Monitoring Plan (EMP) • Preparation of Environmental and Social Impact Assessment report • Submission of the reports to NEMA • Development of environmental monitoring indicators • Public disclosure on the NEMA website

8. Experience in development Project Management:

Name of the Project	Consultancy services for proposed design and construction of water pipeline extension and sewer pipeline extension in the informal settlements of Nairobi, Nakuru, Naivasha and Mombasa
Date	2013-2018
Country	Kenya Korogocho LIC, Kinyago, Kanuku, Kitui and Blue estate villages in Biafra Eastleigh, Nairobi County. Mwengenye Area, Njiru, Nairobi County. Toa Tugawe Community Kisauni Division, Mombasa County County Council Residential Area, Naivasha, Nakuru County Lake View/Kihoto Community Naivasha Sub-County, Nakuru County Kivumbini/ DC Quarters, Nakuru East Constituency, Nakuru County Mwariki B/Mzee Wanyama, Nakuru East Constituency, Nakuru County
Employer	Nairobi City Water and Sewerage Company (NCWSC) Mombasa Water and Sanitation Company (MOWASCO) Nakuru Water, Sewerage and Sanitation Company (NAWASCO)
Financier	Water and Sanitation for the Urban Poor-
Role	Stakeholder Engagement and Community Mobilization Expert
Description of Tasks	• Screening the subprojects as to their potential environmental, social, economic impacts as well as their potential to cause resettlement. • Description and Review of the Legislative and Regulatory Framework • Delineation of Environmental, Social and Economic Baseline • Detailed Socio-Economic Survey- Collection of socio-economic & environmental data and analysis of data collected and delineating of baseline • Detailed Baseline Census survey of the project affected households/persons for RAP • Analyze on the nature and Significance of the Adverse Impacts • Assessment of the impact of the subprojects on the environment addressing the major ecological and social issues; • Identify Risks & Potential Negative Impacts • Enumerating the Project Affected Persons by type of impact - Identification of Project Affected People (PAPs) and their affected assets or the loss to access of resources; ➢ Identify all potential project affected persons and the impacts of the proposed projects on their livelihoods and recommend measures to minimize Resettlement effects and safeguard livelihoods. ➢ Carry out a socio-economic survey to generate baseline data for monitoring and evaluation during project implementation period. ➢ Carry out an asset inventory survey of all potential assets that will be affected by the proposed projects

	➢ Provide guidelines to stakeholders participating in the minimizing of resettlement impacts of the project ➢ Recommend cost effective measures to be implemented to safeguard the livelihoods. To prepare a Resettlement Action Plan (RAP) report compliant to The World Bank Regulations. ➢ Development of agenda for public participation for such for a & the RAP ➢ Development and costing of mitigation actions and monitoring framework • Define Appropriate Mitigation Measures - ESMP & RAP - Provision of recommended Environmental Management And Social Mitigation measures to adopt before, during and after (pre and post) implementation of the subprojects; • Provision of mitigation measures and compensation in accordance to the Kenya Government Laws and the World Bank guidelines • Public Consultations - for EIA & RAP - Development of agenda for public participation for a and Carrying out public consultation meetings for the various PAPs • Development of a Re-settlement Action Plan where re-location and/or compensation of persons was envisaged. • Define the Compensation Modalities and Preparation of an implementation schedule for the RAP • Development and costing of mitigation actions (the EMP) &RAP • ESIA & RAP Monitoring Plan and reporting

Name of the Project	Water and Sanitation Development Project (WSDP) Laying of Distribution Lines from Mabokoni Reservoir to Ukunda town and Environs and Construction of 12 water Kiosks Construction of water distribution works in Mtwapa town.
Date	May 2021 to date
Country	KENYA- Kwale County and Kilifi County
Employer	Kwale Water and Sewerage Company (KWAWASCO) Kilifi Marikana Water and Sewerage Company (KIMAWASCO)
Financier	World bank
Role	Environment and Social Safeguard Officer
Description of Tasks	• Develop Contractor's Environmental and Social Management Plan and associated plans such as Waste Management Plans and Occupational, Health and Safety Plans among other plans and procedures and determine their adequacy and level of implementation; • Update the Environment and Social Management Plans prepared under the project as necessary; • Conduct regular field visits to assess and monitor Environmental Health and Safety (EHS) compliance where construction activities are ongoing and at contractor's facilities to monitor that EHS measures and controls are in operation as described and intended in the approved safeguard instruments and Contractor's ESMP's; • Undertake training and capacity building to the employer/client and contractors' staff on Environmental, Social, Health and Safety issues • Evaluate the risk and impacts of the project activities related to the environment, health, safety and security of the surrounding communities and establish preventive and control measures consistent with the ESMP and good international industry practice. • Carry out training Program, including stakeholder engagement and consultation for HIV/AIDs awareness, sexually Transmitted infections, Gender based Violence (GBV) and Sexual Exploitation and Abuse. • Reviewing documentation pertaining to environmental and social compliance (including monthly and quarterly project progress reports, Environment and Social reports, grievance logs, incidents and accidents logs) during project implementation; • Assess if the grievance redress mechanisms established for the project are functioning appropriately and the individual projects are implemented in an environmentally and socially sustainable manner; • Assess the major environmental, health and safety non-compliances, incidents and propose corrective actions with strict time-lines;

	• Ensure adherence to the infection prevention and control measures by the contractors as guided by the Ministry of Health/ World Bank guidance note on managing COVID-19 in ongoing Bank financed civil works and contingency planning of project sites. • Contribute to project progress reports pertaining to overall implementation of environmental and social requirements of the project.

Name of the Project	Comoros Inter- Island Connectivity project (PICMC)- Rehabilitation of the RN21 between Domoni and Mremani in Anjouan (14km) and Rehabilitation works of the RN32 between Wallah and Nioumachoua in Moheli (9km)
Date	May 2023
Country	Comoros- Madagascar
Employer	**Union of the Comoros- Ministry of Maritime and Air Transport**
Financier	African Development bank (AfDB)
Role	**Environmental and Social Safeguard Specialist**
Description of Tasks	• The task involved Familiarization with each of the World Bank's environmental and social safeguard policies that have been triggered for the project. • Reviewing ESMF/ESMP/ESIAs/RPF/ VMGF and other environmental and social safeguards project documents to ensure project implementation complies with the provision of these instruments and the requirements of the relevant laws of the Government of Kenya. • Ensuring the RAPs and VMGPs are prepared (as necessary) in accordance with the provisions of the RPF and VMGF respectively, overseeing the preparation of an accessible and consulted upon Grievance Redress Mechanism (GRM) for the project, Responsible for all the messaging going out to the Project Affected Person's (PAPs), including their rights and entitlements, • Supervision and monitoring of the implementation of environmental and social instruments (ESMP, ESIA, RAP, VMGP in accordance with the respective guidelines and policies, • Supporting implementing agencies in the review of documentation pertaining to environmental and social compliance (including technical specifications, review of on-site reports from contractors etc.) during project implementation. • Preparing training materials, and conducting technical training workshops to County and Market Project Implementing Teams (PITs) and community committees on environmental and social safeguards requirements and developing a stakeholder engagement and communication plan and strategy; • Review the proposed grievance redress mechanism, and support the forming of the grievance committees, and communication of the grievance mechanism to all the stakeholders, and other relevant procedures as per guidance in the RAP. • Undertake inventory of project sites committees and suggest mechanism that will ensure that Market site project committees provide for constitution of the committees in an all-inclusive manner (including mainstreaming gender issues with the creation of separate committees for women, if men and women will not meet together); • Preparation of Environment and Social Monitoring and Evaluation reports and perform tasks and responsibilities related to the social issues including Sexual Exploitation and Abuse by project workers (including the contractors and implementing agency staff), HIV/AIDs program at construction sites, dealing with issues related to labour influx (people coming into the project area for project related work).

Name of the Project	RAP for Bahari Wind Farm- **Bahari Wind Energy Project**
Date	JULY 2019 – DECEMBER 2019
Country	Mpeketoni- Lamu County
Employer	KENWIND AGENCIES
Financier	Belgium Government
Role	Social Safeguard Officer

Description of Tasks	**The role entailed;** Describing the project and the project's area of influence. This included a description of the project components or activities that would give rise to relocation, zone of impact of such activities, and the alternatives considered to avoid or minimize relocation. Carry out a socio-economic survey of a sample of 20-25% of the re-settlers to establish a baseline of incomes & expenditures, occupational and livelihood pattern, use of resources, arrangements for use of common property, social organization, leadership patterns, community organizations, and cultural parameters. The survey method and output shall be proposed by the Consultant(s) and approved by the Client before conducting the survey. **Carrying out Socio-economic studies which included the following;** (a) A population census covering current occupants of the affected area, including the description of the production systems, household organization, baseline information on livelihoods and standards of living of the displaced population; (b) An inventory of assets of displaced households; the magnitude of the expected loss – total or partial for individual or group assets, and the extent of physical and economic displacement; (c) Information on disadvantaged groups or persons for whom special provisions may have to be made; (d) Provisions to update information on the affected people's livelihoods and standards of living at regular intervals so that the latest information is available at the time of their displacement; (d) Description of land tenure systems, including common property and non-title-based land ownership or allocation system recognized locally and related issues; Public infrastructure and social services that will be affected; and (f) Social and cultural characteristics of displaced communities- Compile the collected data of the socio-economic survey with MS Excel or any appropriate software and analyse the data to prepare a RAP for the wind project. (e) Definition of Project Affected Persons (PAPs) and Eligibility Criteria: - (i) Define Project Affected Persons (PAPS) or relocated persons if any and the criteria for determining their eligibility for compensation and other assistance, including relevant cut-off dates. (ii) Identify the number of 1) Project Affected Persons who need compensation and 2) Project Affected Persons (PAPs) whose property is acquired but not resettled by conducting a census survey. Prepare the inventory list of the Project Affected Persons (PAPs). The list shall include, but not limited to, the names of the head of the residents' households and/or landholders, the addresses, locations on the map and photos of the affected structures. The survey method and output shall be proposed by the Consultant(s) and approved by the Client before conducting the survey. This will be done by conducting land searches at the Ministry of lands offices to determine the real owners of the parcels of lands. (f) Community Participation (i) Describe the consultation and participation of the displaced and hosts communities in the design and implementation of the resettlement activities including a summary of the views expressed and how these views were taken into account in preparing the resettlement plan.

	Review the resettlement alternatives presented and choices made by displaced persons, including choices related to forms of compensation and resettlement assistance, to relocating as individual families or as part of pre-existing communities, and to retaining access to cultural property (e.g., places of worship, cemeteries, etc.). (iii) Describe the procedures for redress of grievances by people affected to project authorities throughout the planning and implementation. (g) Valuation of and compensation for losses (i) Describe the methodology to be used in valuing losses to determine their replacement cost; including the proposed types and levels of compensation under local laws and such supplementary measures to achieve replacement cost for lost assets; (ii) Describe the packages of compensation and other resettlement measures that will assist each category of eligible displaced persons to achieve the objectives of the compensation Policy. This includes the entitlement matrix.

Certification:
I, the undersigned, certify that to the best of my knowledge, these data correctly describe me, my qualifications and my experience.

Name of the Expert: Alice Abuyah

Signature 

FORM 7 (r.15(2))

nema

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)

THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT

ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT (EIA/EA) PRACTICING LICENSE

License No : NEMA/EIA/ERPL/9248

Application Reference No:

M/S **Alice Achieng Abuyah**
(individual or firm) of address

P.O. Box 6250,Kisumu

is licensed to practice in the

capacity of a (Lead Expert/Associate Expert/Firm of Experts) **Associate expert**
registration number **9931**

in accordance with the provision of the Environmental Management and Coordination Act Cap 387.

Issued Date: **1/28/2021** Expiry Date: **12/31/2021**

Signature.....

(Seal)
Director General
The National Environment Management Authority

P.T.O.

ISO 9001: 2008 Certified

hydrologist as part of the ESIA team, provide their CV

STEVEN OKOTH OWUOR

Contact address **:** P.O. Box 33350- 0600 Nairobi, Ngara.

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Email : okothanumo@yahoo.com; owuorstevens@gmail.com

PERSONAL DATAILS
Date of Birth: 6th July, 1983
Nationality: Kenyan
Marital Status: Married (with 3 children)
Profession: Hydrogeologist
KEY QUALIFICATIONS AND EXPERIENCE

An integrity and result-driven hydrogeologist with 12 years of experience within hydrogeology and lecturing in geological field offering proven record on bringing success and increased productivity. Accomplished in groundwater exploration and development, groundwater mapping and assessment, and planning and implementation of field programs. Demonstrated project management, reporting and analysis skills. I have ability to identify, interpret and evaluate new opportunities and organize, manage and analyze data.
Advanced skills in modelling and interpretation, drilling and sampling programs, GIS and database system and technical reporting. Good working knowledge in R software, python, Hydrus-1D, Aqtesolv, ArcGIS and QGIS.
In 2019, I was awarded PhD. Degree in Hydrogeology at Freiburg University, Germany. My research focused on understanding how land use and land cover changes affect groundwater recharge process. In the study, quantification of groundwater recharge was done using soil physics simulation i.e. simulation through unsaturated zone.
I received Master of Science degree in Tropical Hydrogeology, Engineering Geology and Environmental Management from Technische Universität Darmstadt, Germany in
2012. I received BSc degree in Geology in 2007 from the University of Nairobi, Kenya.
I am a Geologist at Ministry of Water, Sanitation and Irrigation in the Department of Water Resources. I joined the Ministry in April 2008 and I am mainly involved in hydrogeological and geophysical investigations, management of drilling contracts, supervision of drilling works and pump testing operations, borehole design and construction, review of Environmental Impact Assessment (EIA) reports for water development projects, general management of groundwater resources and policy formulation. I have undertaken several Environmental Impact Assessment study for borehole drilling.
Worked as part time Lecturer at South Eastern Kenya University from May to August
2013. From September, 2013 to March, 2017 I was engaged as Tutorial Fellow at South Eastern Kenya University, Department of Geological Sciences on secondment from Ministry of Water and Irrigation. I was involved in teaching various undergraduate courses. I was also appointed exams coordinator for the Institute of Mining and Mineral Processing.

Worked for Turn-O-Metal engineers from January to April 2008. Was mainly involved in Logging of cores drilled in Mui Basin, Mwingi District for coal exploration by Ministry of Energy, groundwater exploration for boreholes to be drilled in Primary schools in Eastern Equatoria, South Sudan, preparation of project tender documents including bills of quantities and work plan.
Worked for Earthview Geoconsultants from November 2007 to January 2008. Was mainly involved in Environmental Impact Assessment study for oil and gas exploration in Eastern and North Eastern provinces, Kenya; assisted in groundwater exploration by use of vertical electrical sounding method.
Trained on Environmental Impact Assessment and Auditing sponsored by Nile Basin- Initiative (May 2008).
Trained on Geophysical techniques for Groundwater Exploration offered by United States Geological Survey (October 2008).
EDUCATION

2014 - 2019 To date University of Freiburg, Germany
Ph.D. Hydrogeology

Thesis: "Quantifying effects of land use/ land cover change on soil hydraulic properties and groundwater recharge in South West Mau, Kenya"

2010-2012 Technische Universität Darmstadt, Germany
Masters of Science in Tropical Hydrogeology, Engineering Geology and Environmental Management
Thesis: "Hydraulic Characteristics and Hydrochemistry of Nairobi Area, Kenya"

2003-2007 University of Nairobi, Nairobi, Kenya Bachelor of Science (Upper second class) Major Subject: Geology
Minor Subject: Mathematics and Chemistry

1998-2001 Nyagoko Secondary School, Bondo, Kenya
Kenya Certificate of Secondary School

1990-1997 Nyagoko Primary School, Bondo, Kenya
Kenya Certificate of Primary Education

Professional Affiliations

1. Professional Member of the Geological Society of Kenya, Member No. 735
2. Member of the Hydrological Society of Kenya
3. Registered Professional Geologist with Geologist Registration Board of Kenya, Registration No. 246.
4. Licensed water professional (hydrogeologist and hydrologist) by Ministry of Water & Sanitation and Irrigation, License Number WD/ WRP/208.
5. Registered Lead Expert with National Environmental Management Authority (NEMA), Registration No. 9903.
6. Member of Environment Institute of Kenya

Scholarships

2010 – 2012 German Academic Exchange Service (DAAD) scholarship to study- (M. Sc.)
2014 – 2017 Karlsruhe Institute of Technology scholarship for PhD Study.

EMPLOYMENT RECORD

Period: September 2019 to date: Ministry of Water, Sanitation and Irrigation
Position: Principal Water Research Officer
Period: March 2017 to September 2019: Ministry of Water and Irrigation

Position: Geologist I
Period: September 2013 to March 2017: South Eastern Kenya University
Position: Tutorial Fellow (**on secondment**)
Task assigned: Teaching, demonstrations and examining Undergraduate students and carrying out research projects and advancement of knowledge in Institute of Mining and Mineral Processing.

Professional Experience

November 2021: Carried out hydrogeological surveys for twelve (12) boreholes in Tana River County for Small Scale Irrigation and Value Addition Project (SIVAP) for Ministry of Agriculture.
May 2021: Carried out hydrogeological surveys for ten (10) boreholes in Samburu County for Small Scale Irrigation and Value Addition Project (SIVAP) for Ministry of Agriculture.
2019-2021 Coordination for borehole drilling for various Kenya Medical Training College campuses. Project coordination and scheduling; planning and implementation of borehole drilling and equipping programs including field data collection and data management; preparation of drilling reports.
March 2020 – August 2020: Hydrogeologist in the multi-agency groundwater development project within Nairobi City County informal settlements to fight COVID- 19 effect.
April 2019: Was involved in Environmental Impact Assessment for spraying to control tsetse fly in Meru Conservation Area
August 2019: Involved in feasibility study for small dams in Baringo and Nakuru Counties. Analysis of hydrological and geological data for dam siting.
2018-to date: Member of Contract Implementation Team (CIT) for construction of Thwake Multipurpose Dam.
2017-2020 Coordinating Groundwater Mapping and Assessment of Turkana, Marsabit, Wajir and Mandera Counties. Contribution to technical studies and compilation of technical report; presentation of technical

results as maps; processing and interpretation of borehole geophysical logs; development of Geographic Information System (GIS), querying and analysis of GIS data; consolidation of geological data and technical results into presentation for top Managers of the Ministry.

March- May 2013: Supervision of six (6) Boreholes drilled Under Konza Technology City project in Makueni County. Duties including borehole logging design and pump testing operations.

May 2013: Supervision of drilling of deep (600 m) and shallow (250 m) boreholes in Kiunyu and Ruiru for Athi Water Services Board. Duties included: review, compilations and interpretation of geological data; processing and interpretation of geophysical logs.

2013 -2017 Involved in the following assignments

- Teaching of the following courses to undergraduate students: ELM 102 Introduction to Earth Sciences, SGL 201 Principles of Mineralogy, SGL 202 Systematic Mineralogy, SGL 301 Igneous Petrology, SGL 304 Stratigraphy, SGL 310 Photo geology and Remote Sensing, SGL 402 Ore Deposits, SGL 406 Hydrogeology, SGL 407 Engineering Geology, SGL 412 Seismology, WRM 309 Flood Forecasting and Mitigation, WRM 204 Groundwater Hydrology, ENF 309 Remote Sensing & GIS.
    - Setting, moderating, administering, processing and marking examinations
    - Supervision of final year projects for undergraduate Geology students
- Together with others, developed a course in Msc. In Mining and Mineral Processing; Bsc. In Hydrogeology and Diploma in Gemstones in the Department of Geological Sciences, South Eastern Kenya University.
- Examination's coordinator in the Institute of Mining and Mineral Processing, South Eastern Kenya University
- Acting as the Director of Institute of Mining and Mineral Processing in the absence of the substantive Director.
- Acting as the Chairman of Department of Geological Sciences in the absence of the substantive Chairman.

January-2009: Took part in the preparation of Bid documents for Tenders of Drought Emergency Intervention Programme.

February – 2009: Carried out hydrogeological surveys for ten (10) boreholes with a team constituted at the ministry to confirm the groundwater potential of the sites earmarked for drilling under the drought intervention programme in various districts in North Eastern Kenya.

March 2009: Carried out hydrogeological surveys for three (3) boreholes with a team constituted at the Ministry to confirm the groundwater potential of the sites earmarked for drilling in Loitoktok area.

April – June 2009: Supervision of Boreholes drilling works Under Drought Emergency Programme. Duties including borehole logging and design and pump testing operations, borehole design and construction. The project realized drilling and equipping of fifty (50) boreholes in various parts of Kenya.

July 2009: Supervision of six (6) Boreholes drilled Under Drought Emergency Programme in Kitengela-Athi River area. Duties including borehole logging, design and pump testing operations.

August 2009: Supervision of two (2) Boreholes drilled Under Drought Emergency Programme in Kiambu and Nairobi areas. Duties including borehole logging, design and pump testing operations.

October 2009: Supervision of five (5) Boreholes drilled Under Drought Emergency Programme in Naru Moru area. Duties including borehole logging design and pump testing operations.

October-December 2009: Supervision of ten (10) Boreholes drilled Under Drought Emergency Programme in Nairobi area for Athi Water Services Board. Duties including borehole logging design and pump testing operations.

December 2009: Supervision of three (3) Boreholes drilled Under Drought Emergency Programme in Turkana area. Duties including borehole logging design and pump testing operations.

April-June 2010: Supervision of six (6) Boreholes drilled Under Drought Emergency Programme in Mwingi-Kyuso area. Duties including borehole logging design and pump testing operations.

June 2010: Supervision of three (3) Boreholes drilled Under Drought Emergency Programme in Kajiado area. Duties including borehole logging design and pump testing operations.

PAPERS

REFEREED JOURNAL PUBLICATIONS

1. **S.O. Owuor**, K. Butterbach-Bahl, A.C. Guzha, S. Jacobs, L. Merbold, M.C.

Rufino, D.E. Pelster, E. Díaz-Pinés, L. Breuer. Conversion of natural forest results in a significant degradation of soil hydraulic properties in the highlands of Kenya. Soil and Tillage Research 176 (2018) 36-44, doi: dx.doi.org/10.1016/j.still.2017.10.003

2. A.C. Guzha, M.C. Rufino, **S. Okoth**, S. Jacobs, R.L.B. Nobrega. Impacts of land use and land cover change on surface runoff, discharge and low flows: Evidence from East Africa.Journal of Hydrology: Regional Studies 15(2018) 49-67, doi: https://doi.org/10.1016/j.ejrh.2017.11.005
3. **S. O. Owuor**, K. Butterbach-Bahl, A. C. Guzha, M. C. Rufino, D. E. Pelster, E. Díaz-Pinés and L. Breuer (2016). Groundwater recharge rates and surface runoff response to land use and land cover changes in semi-arid environments. *Ecological Processes* 5:16, doi: 10.1186/s13717-016-0060-6.
4. **Steven. O. Owuor**, Christoph Schüth, Rouwen J. Lehné, Andreas Hoppe, Joshua Obiri, Daniel M. Nyaberi and Monicah K. Kibet (2016). Estimation of Hydraulic Properties from Pumping Tests Data of Nairobi Area, Kenya. *International Journal of Research in Engineering and Technology*, Vol.5 (2), 331-339, doi: 10.15623/ijret.2016.0502060

REFEREED CONFERENCE PUBLICATIONS

1. **Steven Owuor**, Klaus Butterbach-Bahl, Alphonce Guzha, Mariana Rufino, David Pelster, Eugenio Díaz-Pinés, Lutz Breuer, and Lutz Merbold, 2017. Groundwater Recharge Rates and Surface Runoff Response to Land Use and Land Cover Changes in Semi-Arid Environments (EGU2017-17140). European Geosciences Union General Assembly (EGU), April 23–28 2017, Vienna, Austria, oral presentation.
2. **Steven Owuor**. Review of Potential of Rainwater Harvesting in Kenya: Partial Solution to Environmental Problems. Presented in the 12th Geological Society of Kenya Conference Proceedings, March2009.
3. **Steven Owuor**. Environmental Impacts and Management of Solid Waste, Case Study of Nairobi, Kenya. Presented in the 12th Geological Society of Kenya Conference Proceedings, March 2009.

LANGUAGES

	Speaking	**Reading**	**Writing**
English	Excellent	Excellent	Excellent
Kiswahili	Good	Good	Good

REFEREES

1. Mr. Chrispine Omondi Juma, Director Water Resources, Ministry of Water & Sanitation and Irrigation. P.O. B0x 49720-00100 Nairobi. Cell phone 0722791230
2. Dr. Alphonce Guzha, Research Scientist, United States Forest Service, P.O. Box 30677 - 00100 Nairobi, Kenya. Cell phone 0701056084.
3. Mr. John Gondi Nyakwaka, Senior Superintendent Geologist, Ministry of Water & Sanitation and Irrigation. P.O. B0x 49720-00100 Nairobi. Cell phone 0724952879

REPUBLIC OF KENYA

(THE WATER ACT) Licence No. WD/WP/208

LICENCE

QUALIFIED WATER RESOURCE PROFESSIONAL
(HYDROGEOLOGY & HYDROLOGY)

Rule 134

Mr. Steven O. Owuor,
P.O. Box 33350-00600n Nairobi.

Dear Sir,
I have the honour to inform you that the Ministry of Water and Sanitation has given you a licence to operate as a Qualified Water Resource Professional in the following category:

DETAILS OF QUALIFIED WATER RESOURCE PROFESSIONAL:

Name:	***STEVEN OKOTH OWUOR***
Town:	*Nairobi*
Post Office Box:	*33350*
Postal Code:	*00600*
Pin Number:	*A0043760181.*
Telephone Contact (Land Line):	****
Telephone Contact (Mobile):	*0711384748, 0737541260*
Email Contact:	***okothanumo@yahoo.com***

DETAILS OF LICENCE: **HYDROGEOLOGY AND HYDROLOGY**

CONDITIONS OF LICENCE:

- *This licence is issued subject to annual gazettement/renewal until further notice.*
- *Licence replaces licence No. WD/WRP/208 dated 27/06/2014 until further notice.*

Yours Faithfully,

MINISTERIAL TECHNICAL ADVISORY COMMITEE
6 DEC 2018

Signature:

Name: ENG. S.A.O. ALIMA

Position: *Ag. DIRECTOR WATER SEWERAGE & SANITATION DEVELOPMENT*
Chairman Ministerial Technical Advisory Committee

Date of issue: 6th December, 2018

*This licence is issued without any erasures whatsoever. (MTAC-P-12/2018)

APPENDICES;

Appendix 1: Hydrogeological Report

HYDROLOGICAL REPORT CARRIED OUT AT
MZAMBARAUN WITHIN L.R. NO. 8852
KILIFI COUNTY

FOR

HAZE CONNECT

P.O. BOX 42250-10100 NAIROBI

REPORT NO. HDRG/23/02/005B

COMPILED BY:
STEPHEN OKOTH
OWUOR
(Registered Hydrogeologist)
WD/WRP/208

P.O. BOX 42250 -10100,
NAIROBI

January 2025

SUMMARY

The present report describes the results for groundwater resources hydrogeological investigations for **Hellen Langat and David Langat's parcel** of land at Mzambarauni Village, Mtwapa Sub-County in Kilifi County. The study is required for identifying a suitable site for drilling one production borehole. The client intends to set up the landfill site. The water demand is estimated to be low about $20m^3$/day.

The project area is situated in a zone with low groundwater potential.

TABLE OF CONTENTS

ABBREVIATIONS (All S.I Units unless indicated otherwise)

agl	above ground level
amsl	above mean sea level
bgl	below ground level
E	East
EC	electrical conductivity (μS/cm)
hr	hour
m	meter
N	North
PWL	pumped water level
Q	discharge (m^3/hr)
s	drawdown (m)
S	South
SWL	static water level
T	transmissivity (m^2/day)
VES	Vertical Electrical Sounding
W	West
WAB	Water Apportionment Board
WSL	water struck level
μS/cm	micro-Siemens per centimeter: Unit for electrical conductivity
°C	degrees Celsius: Unit for temperature
"	Inch

GLOSSARY OF TERMS

Alluvium General term for detrital material deposited by flowing water.

Aquifer A geological formation or structure, which stores and transmits water and which is able to supply water to wells, boreholes or springs.

Colluvium General term for detrital material deposited by hill slope gravitational processes, with or without water as an agent. Usually of mixed texture.

Confined aquifer A formation in which the groundwater is isolated from the atmosphere by impermeable geologic formations. Confined water is generally at greater pressure than atmospheric, and will therefore rise above the struck level in a borehole.

Development I n borehole engineering, this is the general term for procedures applied to repair the damage done to the formation during drilling. Often the borehole walls are partially clogged by an impermeable "wall cake", consisting of fine debris crushed during drilling, and clays from the penetrated formations. Well development removes these clayey cakes, and increases the porosity and permeability of the materials around the intake portion of the well. As a result, a higher sustainable yield can be achieved.

Fault A larger fracture surface along which appreciable displacement has taken place.

Gradient The rate of change in total head per unit of distance, which causes flow in the direction of the lowest >head.

Grit Coarse sandstone of angular grain

Hydraulic head Energy contained in a water mass, produced by elevation, pressure or velocity.

Hydrogeological Those factors that deal with subsurface waters and related geological aspects of surface waters.

Infiltration Process of water entering the soil through the ground surface.

Joint Fractures along which no significant displacement has taken place.

Lava sheet Lava flow, in parts very thick, covering a large area.

Percolation Process of water seeping through the unsaturated zone, generally from a surface source to the saturated zone.

Permeability The capacity of a porous medium for transmitting fluid.

Phenocrysts Large, conspicuous crystals in porphyritic rocks (i.e. rocks with visible mineral crystals in a generally fine groundmass).

Phonolite Compact and fine textured volcanic rock, belonging to the trachyte-group (together with *trachyte ss.* and *latite*). Defined by a high portion of feldspar (40-90%) and feldspatoidic minerals (10-60%: analcite, nepheline, leucite, etc.), and very low to negligible quartz content (0-2%). Incorporated dark coloured minerals (0-40%) most commonly include

hornblende, olivine, melanite and acmite. The structure is porphyritic with common phenocrysts of sanidine (orthoclase, or Potassium-feldspar) and nepheline.

Piezometric level An imaginary water table, representing the total head in a confined aquifer: it is defined by the level to which water would rise in a well.

Pyroclastic rocks Group of rocks consisting of volcanic dust, ashes, lapilli and coarse lumps of lava, explosively thrown up in molten condition, and deposited by gravity. Hardened masses of dust, ashes and lapilli are known as *tuff*, while coarse, consolidated pyroclastic debris is referred to as *agglomerate.*

Porosity The portion of bulk volume in a rock or sediment that is occupied by openings, whether isolated or connected.

Pumping test A test that is conducted to determine aquifer and/or well characteristics.

Recharge General term applied to the passage of water from surface or subsurface sources (e.g. rivers, rainfall, lateral groundwater flow) to the aquifer zones.

Static water level The level of water in a well that is not being affected by pumping (a.k.a. "rest water level")

Transmissivity A measure for the capacity of an aquifer to conduct water through its saturated thickness (m^2/day).

Tuff Here: hardened volcanic ash.

Unconfined Referring to an aquifer situation whereby the water table is exposed to the atmosphere through openings in the overlying materials (as opposed to >confined conditions).

1. INTRODUCTION

In February 2023, Dr Helen Langat commissioned the carrying out of groundwater resources investigations/hydrogeological study at their parcel of land**.** The land is located at Mzambarauni, Mtwapa Kilifi County

The address of the client is:

Helen Langat and David Langat
P.O. Box 42250-10100,
Nairobi

The client intends to drill the borehole within their parcel of land in order to have a reliable water supply.

The study was carried out as follows:

i. Detailed desk study. This included review of existing information, maps, and reports in the vicinity of the project area, surrounding borehole data analyses etc.
ii. Field reconnaissance and hydrogeological study of the project area.
iii. Analysis of all gathered information including hydrogeological data, geological logs of surrounding boreholes, groundwater water level in the boreholes and water quality parameters.
iv. Data analyses and reporting.

The report describes the hydrogeological investigations and conditions/ groundwater availability within the compound, recommendations and conclusions for the study.

2. BACKGROUND INFORMATION

2.1 Location

The site is situated in Mzambarauni Village, Mtwapa Sub-County in Kilifi County. It lies within the Survey of Kenya topographic sheet number 3051/32 of Kilifi Area. Its defining coordinates are -1.47084664, 36.93939392 or 37M 270731 UTM 9837321 at an elevation of about 1566 meters above mean sea level.

2.2 Physiography

The land lies at an altitude of about 1566m amsl.

2.3 Climate

The climate of the area has an annual rainfall of approximately 1200 mm. The area displays a bi-modal rainfall pattern with two rainy seasons, which are concentrated in the months of March to May and October to December though sometimes it takes longer time in order for the some areas to receive rainfall. The hottest part of the year is from January to March.

The precipitation varies 68 mm between the driest month in February and the wettest month in April with 330 mm. During the year, in the cold period, the temperatures range between 17 and 22 degrees and may drop to about 9 °C.

2.4 Water Demand

Water from the proposed borehole will be used for domestic purposes. Water demand is estimated at 20m³/day to serve a population of more than 1000 people as shown below.

Water Use Activity	Demand (m^3/h)
Domestic	20.0
Irrigation	0.0
Industrial	0.0
TOTAL	20.0

3. GEOLOGY

3.1 Regional Geology

The geology of the area is comprised of Tertiary-to-Quaternary volcanic layers, which include tuffs, trachytes, basalts, phonolites, and shallow to deep seated basement rocks. These are overlain by recent clayey loams, or alluvial deposits and soil composed of laterites, clayey loams, dark-red to brown clayey loams and small fraction of gravels. The influence of faults, joints and other fractures on groundwater in the study area is two way. They act as drainage channels of groundwater flow and also as aquifers in the area. The area receives groundwater recharge from the Hills which is to the west of the site, s which is to the north west of the site and the flow is towards the lower areas. The soil retains water for an extended period of time after the rains and this partly recharges aquifers in the area.

3.2 Geology of Study Area

- ✓ Dark-red brown clayey loam Soils
- ✓ Decomposed regolith
- ✓ Tuffs
- ✓ Trachytes
- ✓ Phonolite
- ✓ Basalt
- ✓ Shallow-to-deep seated basement.

4. HYDROGEOLOGY

4.1 Introduction

The project area is located in an area that has moderate-to-high groundwater potential. The possible variations of the tested yields for the surrounding boreholes is due to varying drilled depths, aquifer characteristics differences, and differences in casings and screens designs.

The main aquifers are in the weathered/fractured formations. Borehole specific capacities are calculated using the formula S=Q/s (Driscoll, 1986) where Q is the yield during pump test and s is the drawdown that is represented by pumping water level less static water level (PWL - SWL).

4.2 Transmissivity, Specific Yields and Storage Coefficients

Transmissivity is calculated using the formula T=0.183Q/s. This formula has a limitation because borehole completion data from Ministry of Water and Irrigation gives the summary of pump test. It is ideal if the test pump data is in log scale.

Logan's formula T=1.22Q/s is the best for estimating transmissivity.

The area does have aquifer tests but could not be easily accessible and it is difficult to ascertain specific yields, storage coefficients of existing boreholes in the project area. From Driscoll 1986 the following is a summary of Specific Yield ranges for earth materials.

Table of Specific Yield Ranges of Different Materials

Earth Material	Specific Yield %

Limestone &	**0.5 -**
Sandstone	**5 -**
Clay	**1 -**
Sand and Gravel	**15 -**
Grave	**15 -**
San	**10 -**

4.3 Hydraulic Conductivity and Groundwater Flux

Hydraulic conductivity and groundwater flux can only be determined accurately by use of locations laboratory investigations and Isotope methods that are very expensive methods. The results are confined to few locations, and they depend on the scale of the investigation method. Rock sample measurements in laboratory vary from well test results. Ministry of Water and Irrigation data is also not very reliable.

The Hydraulic Conductivity (K) is estimated as follows:

K = T/Aquifer Thickness

4.4 Groundwater Flux

The Groundwater Flux (F) is estimated based on boreholes more or less share the same aquifers.

F = K.i.h.w Where K- Hydraulic Conductivity

i – Slope

h- Aquifer Thickness

w- Arbitrary distance,

Table showing Hydraulic conductivities of typical geologic material (Bear, 1972, Freeze and Cherry, 1979)

K(m/day)	**10^5**	**10^3**	**10^2**	**10**	**1**	**10^{-1}**	**10^{-2}**	**10^{-3}**	**10^{-4}**	**10^{-5}**	**10^{-6}**	**10^{-8}**	**10^{-10}**
K (ft/day)	**10^6**	**10^4**	**10^3**	**100**	**10**	**1**	**0.1**	**0.01**	**0.001**	**0.001**	**10^{-5}**	**10^{-7}**	**10^{-9}**
Relatively permeability aquifer	**Pervious**				**Semi- Pervious**				**Impervious**				
Unconsolidated Sand & Gravel	**Well sorted Gravel**		**Well sorted Sand or Sand & Gravel**			**Very fine Sand, Silt, Loess, Loam**							
Unconsolidated Clay & Organic				**Peat**		**Layered Clay**			**Unweathered Clay**				
Consolidated Rocks	**Highly Fractured Rocks**			**Oil Reservoir Rocks**			**Fresh Sandstone**		**Fresh Limestone, Dolomite**			**Fresh Granite**	

4.5 Recharge/ Discharge Considerations

With suitable storage media existing in the underlying rocks mechanisms by which water must reach it also affect aquifer potential.

Both Basement Rocks and volcanic systems suffer the same limitations so far as recharge

is concerned: if rainfall is low the volume of water which may eventually percolate to a suitable aquifer is likely to be relatively small, and possibly mineralised due to high evaporation rate.

Percolation is dependent on soil structure, vegetable coverage and the erosion state of the parent rock. Rocks which weather to clayey soils will naturally inhibit percolation (such as black cotton soils); conversely, the sandy soils resulting from the erosion of some Basement rocks are eminently suited to deep, swift percolation. Recharge is the term applied to the whole mechanism, and includes all the aspects of parent geology, effective rainfall and percolation. Some aquifer systems are recharged by water falling a substantial distance away.

4.6 Assessment of Availability of Groundwater

Aquifers in this area are within the weathered, fractured and decomposed formations.

4.7 Analysis of Reserve and Groundwater Evolution

It is difficult to accurately determine the storage of groundwater in the underlying aquifer. To determine this it requires a very intensive exercise and accurate data that will show the boundaries and it extends both horizontal and vertical. So many techniques are also involved.

5. GEOPHYSICAL INVESTIGATION METHODS

A great variety of geophysical methods are available to assist in the assessment of geological subsurface conditions. In the present survey resistivity (also known as the geo-electrical method) has been used.

5.1 Resistivity Method

Vertical electrical soundings (VES) were carried out to probe the condition of the sub-surface and to confirm the existence of deep groundwater. The VES investigates the resistivity layering below the site of measurement. This technique is described below.

5.2 Basic Principles

The electrical properties of rocks in the upper part of the earth's crust are dependent upon the lithology, porosity, and the degree of pore space satu- ration and the salinity of the pore water. Saturated rocks have lower resistivities than unsaturated and dry rocks. The higher the porosity of the saturated rock, the lower its resistivity, and the higher the salinity of the satu- rating fluids, the lower the resistivity. The presence of clays and conductive minerals also reduces the resistivity of the rock.

The resistivity of earth materials can be studied by measuring the electrical potential distribution produced at the earth's surface by an electric current that is passed through the earth.

The resistance R of a certain material is directly proportional to its length L and cross-sectional area A, expressed as:

$$R = Rs * L/A \qquad \text{(Ohm)} \qquad (1)$$

Where Rs is known as the specific resistivity, characteristic of the material and independent of its shape or size. With Ohm's Law,

$$R = dV/I \qquad \text{(Ohm)} \qquad (2)$$

Where dV is the potential difference across the resistor and I is the electric current through the resistor, the specific resistivity may be determined by:

$$Rs = (A/L) * (dV/I) \qquad \text{(Ohm.m)} \qquad (3)$$

5.3 Vertical Electrical Soundings (VES).

When carrying out a resistivity sounding, current is led into the ground by means of two electrodes. With two other electrodes, situated near the centre of the array, the potential field generated by the current is measured. From the observations of the current strength and the potential difference, and taking into account the electrode separations, the ground resistivity can be determined.

While carrying out the resistivity sounding the separation between the electrodes is step-wise increased (in what is known as a Schlumberger Array), thus causing the flow of current to penetrate greater depths. When plotting the observed resistivity values against depth on double logarithmic paper, a resistivity graph is formed, which depicts the variation of resistivity with depth.

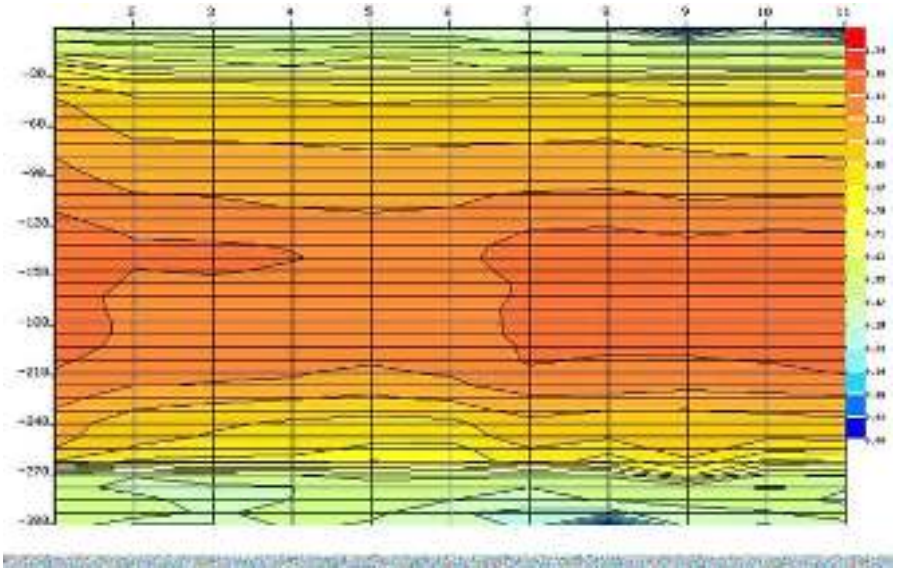
This graph can be interpreted with the aid of a computer, and the actual resistivity layering of the subsoil is obtained. The depths and resistivity values provide the hydrogeologist with information on the geological layering and thus the occurrence of groundwater.

6. FIELDWORK AND RESULTS

Field work was carried out on 4thDecember, 2023. One (1) MT-VES Sounding profile was executed. The aim of the MT sounding profile was to determine the prevailing hydrostratigraphy at the site. Prior to the geophysical investigation inventory of the hydrogeology and other related aspects were carried out within, and in the surroundings of the site.

6.1 Results

MT-VES Profile-1 station 5



Interpretation of VES-5

Depth(m)	Re.(Ohm.m)	FORMATION
0.0 – 20.0	30	Very highly weathered/fractured Tuffs
20.0 – 90.0	50	Weathered/fractured Tuffs
90.0 – 150.0	120	Slightly weathered/fractured Trachytes
150 – 210.0	120	Slightly weathered/fractured Trachytes
210.0-270.0	70	Highly weathered/fractured basalts/phonolites
270.0-300.0	20	Highly weathered/fractured basalts/phonolites

The MT-VES Profile-1 station 5 sounding indicates deep weathering/fracturing considered fairly optimal for groundwater development. The MT-VES Profile-1 station 5 indicates the occurrence of weathered fractured to weathered fractured volcanic lava between the depths of 0 - 210 meters and from 210 - 300 meters thus isolating the location as the most fairly reliable prospect for the proposed development of a borehole facility for medium-to-high scale abstration. There is high probability of occurrence of clays from 0 upto 300 meters and hard rocks from 90 upto 350

7. REFERENCES

DRISCOLL F.G., 1986, Groundwater and Wells, 2nd Ed. Johnson Division

Appendix 1: Land Ownership Documents

REPUBLIC OF KENYA

THE MATTER OF LAND REGISTRATION ACT NO 3 OF 2012

IN THE MATTER OF LAND ACT NO. 5 OF 2012

THE REGISTRATION OF TITLES ACT

CAP.281 (REPEALED)

CERTIFICATE OF TITLE NUMBER CR. 55051

I HEREBY certify that DAVID BETT LANGAT of Post Office Box 81737 MOMBASA in the Republic of Kenya pursuant to a Transfer Number CR.35249/16 are now the registered proprietor as owner for an estate in fee simple of ALL that piece of land situate in N of Mombasa Municipality in the Kilifi District containing by measurement One Decimal Five Seven Five(1.575) Hectares or thereabouts and being Subdivision Number 8852(Orig. No.3051/32) of Section III Mainland North as delineated on Land Survey Plan Number 347961 annexed to the said Transfer.

SUBJECT however to the Act Special Conditions Encumbrances and other matters specified in the Memorandum hereunder written.

IN WITNESS WHEREOF I have hereunto set my hand and seal this 18th day of January Two Thousand and Sixteen

.....

REGISTRAR OF TITLES

S. K. Mwangi '303

MEMORANDUM

1. The land Title Act (Cap 282) Excepting Part III thereof
2. The Registration of Title Act (Cap 281)Repealed

66351/1

18th January, 2016

10.00A

S. K. Mwangi '303

(2) THE FOLLOWING INSTRUMENT HAS BEEN REGISTERED AGAINST THE TITLE

CHARGE TO [redacted] BANK LIMITED (WITH OTHER LANDS) [redacted]

Presentation No. 315 Date of Registration 28/05/[illegible] Registrar

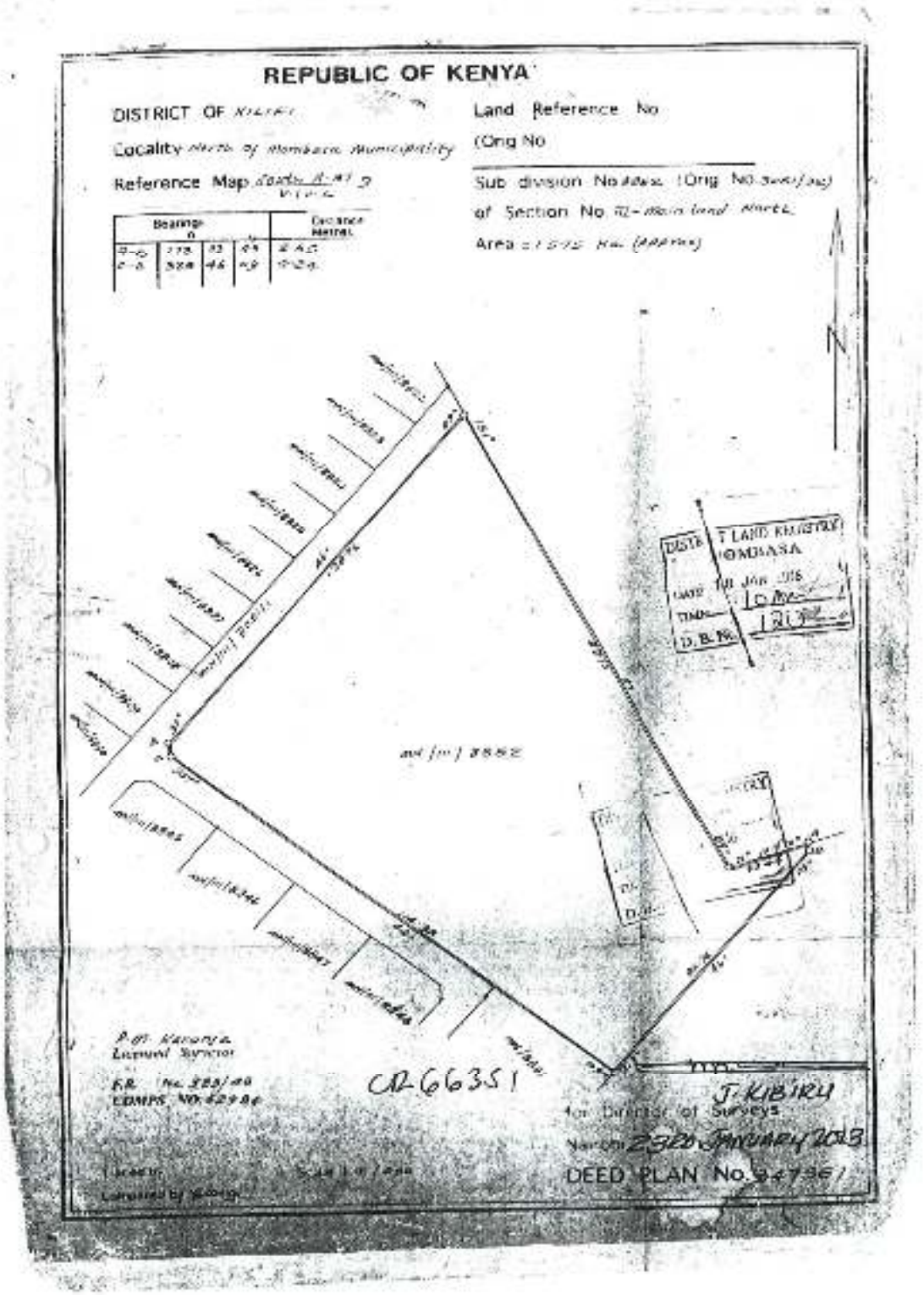
Rama *362

(3) THE FOLLOWING INSTRUMENT HAS BEEN REGISTERED AGAINST THE TITLE

FURTHER C[redacted] TO PARAMOUNT BANK LIMITED ([redacted] LANDS) [redacted]

Presentation No. 316 Date of Registration 28/06/[illegible] Registrar

M. Rama *362


REPUBLIC OF KENYA
DISTRICT OF
Locality North of Mombasa Municipality
Reference Map
Land Reference No
(Orig No
Sub division No
(Orig No
of Section No
Area
Bearing
Distance Metres
LAND REGISTRY
MOMBASA
DATE
TIME
D.B.No
CR 66351
J. KIBIRU
for Director of Surveys
DEED PLAN No.

Appendix 2: Certificate of registration copy

No. PVT/2016/023429

CERTIFICATE OF INCORPORATION

I hereby CERTIFY, that -

HAZE CONNECT LIMITED

is this 26th day of August, 2016 Incorporated under the Companies Act, 2015 and that the Company is PRIVATE LIMITED BY SHARES.

Registrar of Companies

Appendix 4: Public barasa minutes

Minutes of Public Participation meeting for the proposed Asbestos Disposal Site located at Mgambarauni area, Mtwapa subcounty, in Kilifi County.

VENUE: Proposed project site. Date 9th January 2025

Member Present:
As per attached list.

Agenda
1. Preliminaries
2. Proposed Project
3. Public views / raising
4. Adjournment

MIN 1/1/1 2025 - Preliminaries:
The meeting started by a word of prayers from proponents representative Mr. Mohammed this was then followed by introduction of members present led by area chief and a vote of thanks from the project proponents representatives expressing gratitude to stakeholders for availing themselves for the meeting. He informed the stakeholders of the objective of the meeting before handing the floor to Mr. Mbarathi the NEMA registered expert.

MIN 2/Proposed project:
The expert started the description of the project as asbestos management handling and disposal. He clarified that the project supported the National Government commitment towards ensuring safe disposal of asbestos to mitigate its dangers such as cancer infection. He stated to stakeholders that whatever views and recommendation the proponent, he will ensure full compliance and adherance to ensure the project doesn't incur any negative impacts.

Min 3 - Asbestos Effects on living:
The EIA expert took time to advocate the stakeholders on asbestos potential effects. He stated that asbestos have the ability to cause cancer once created through fiber that float in the air and easily carried around or if inhaled. They don't decompose and stay permanently remain loading to fatal diseases. He went ahead to state that all these depends with different factors such as how much asbestos is in the air, how often, or how long exposure

occurs, how much time has passed since exposure began. This informed the reason why the government gave directives for all building with Asbestos to be removed to help reduce exposure risks. The proponent then informed stakeholders that he intended to use a parcel of land to bury asbestos

Min 4/25 - Disposal Procedure

The EIA expert informed the stakeholders that the intended asbestos disposal in the proposed land will be done according to NEMA guidelines that guide asbestos disposal which are as follows:

1. The asbestos should be disposed in a NEMA licensed landfill or pit
2. The handlers will wear PPE.
3. The asbestos waste will be wrapped in thick plastic bags or sheeting, sealed, labelled and transported to a licensed asbestos
4. The landfill will be made of concrete and waterproof cement to avoid leakages to environment.
5. The landfill should be covered with thick slab and fenced off to restrict human encroachment

Min 5/25 - Issues raised / Public views

The stakeholders present were majorly concerned with the potential negative impacts of the asbestos to people area and general environment.

- Abubakar concerned on recruitment: The proponent assured them of hiring locally for any skilled and un-skilled that can be found around. The sensitive areas will be done with professional
- Dida: Will it affect water bodies: Expert reported that a study called hydrological survey had been done and the depth of burying the asbestos will not interfere with any water aquifer.
- Jaum: How will it be transported. The expert indicated that it will be done according to the guidelines, with only licensed trucks, well covered procedurally and handled by the experts only.

Min 6/25 Adjournment

There being no other business, the meeting ended at 4:00 pm with Prayers, ~~Jam by the~~

Confirmation of the minutes

Community representative

Sign

EIA expert: Arnold Moraky

Sign:

LIST OF PARTICIPANTS

DATE : 9/01/2025
MEETING: Public Participation Meeting.

NO.	NAME	REPRESENTATION	TEL NO.	SIGNATURE
1	Issa Owss Nguma	Mzambarauu Settlement Scheme	0713565674	
2.	Grace Bahati	Maweni Village elder	0712 440838	
3.	JUMA NIMAGUMBI	MAWENI YOUTH LEADER	0791 770 476	
4.	DANIEL KARISA	MTWAPA SETTLEMENT	0725912437	
5.	Thomas Muthuni	Mzambarau Settlement Scheme	0703600547	
6.	FLORENCE KAZUNGU	BALOZI MAWENI	0717886893	
7.	KARISA CHENGO	BALOZI MAWENI	0721920141	
8.	LAWIS M. MUCHAI	MTWAPA SETTLEMENT	0722971849	
9.	Grace Taby	Mtwapa Settlement	0724894600	
10.	Habol Nyondi	Balozi Maweni	0712457374	
11.	CHARO MJENGO	MTHANI	0704422325	
12	Mwarau Kalama	Mzambarau	0724596024	
13.	Katana Ngumu	Balozi Mtaani	0712459836	
14.	Ibrahim Muthama	Mwani Village	0724684963	
15.	HIMELDA MONYAU	NZAMBARAU	0713940084	
16.	Arthur Mwambui Mbui	MTWAPA SETTLEMENT	0723429509	
17.	Jonathan Kaluki	Mzambarau	0714927835	
18.	ALICE ABUJAH	MTWAPA SETTLEMENT	0720110382	
19.	Glena Leva	Mtwapa	0717570723	

CHIEF'S OFFICE
MTWAPA SUB COUNTY
MZAMBARAUNI LOCATION
P.O. Box 80100, KILIFI

Appendix 5: NEMA certificate of Lead Expert

EAE 23061268

FORM 7

(r.18(2))

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)

THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT

ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT (EIA/EA) PRACTICING LICENSE

License No: NEMA/EIA/ERPL/21621

Application Reference No: NEMA/EIA/EL/27302

M/S **JOSEPH TUNJE**
(individual or firm) of address
P.O. Box 185-80108 MOMBASA

is licensed to practice in the capacity of a (Lead Expert/Associate Expert/Firm of Experts): **Lead Expert**

General

registration number **1290**

in accordance with the provision of the Environmental Management and Coordination Act Cap 387.

Issued Date: **5/3/2024** Expiry Date: **12/31/2024**

Signature.....

(Seal)
Director General
The National Environment Management Authority

P.T.O.

ISO 9001 : 2015 Certified

Galaxy A04s

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY

Mobile Lines: 0724 253 398, 0725 363 010, 0735 013 046
Telkom Wireless: 020-2165738, 020-2101370
Incident Lines: 0736 101 100, 0741 101 102

P.O Box 67839 - 00200
Popo Road, Nairobi Kenya
Email: info@nema.go.ke
Website: www.nema.go.ke

REF: NEMA/TOR/5/2/862

DATE: 7th March, 2025

The Project Manager,
Haco Contech Limited,
P.O. BOX 43530-10100,
NAIROBI.

RE: TERMS OF REFERENCE (TOR) FOR ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED ASBESTOS DISPOSAL (LANDFILL) SITE ON PLOT L.R. NO. 8852 MZAMBARAUNI AREA, MTWAPA SUB-COUNTY, KILIFI COUNTY.

We acknowledge the receipt of your TOR for the above proposed project.

Pursuant to the Environmental Management and Coordination Act, 1999, the Environmental (Impact Assessment and Audit) Regulations 2003 and legal notice 31 & 88 of 2019, your terms of reference for the Environmental Impact Assessment (EIA) for the **ASBESTOS DISPOSAL (LANDFILL) SITE ON PLOT L.R. NO. 8852 MZAMBARAUNI AREA, MTWAPA SUB COUNTY, KILIFI COUNTY** has been approved with the following conditions:

1. You shall undertake a detailed climate change risks and vulnerability assessment to inform the appropriate adaptation and mitigation measures to climate proof the project in line with provisions of Climate Change Act, 2016.
2. You shall undertake detailed baseline environmental and social conditions on water demand and supply analysis, waste management, noise and excessive vibrations, air quality, traffic impacts, geotechnical and existing land use that exist within the proposed project site.
3. You shall undertake inclusive and detailed Public Participation with the Project Affected Persons (PAPs) in full compliance to Regulations 17 of the EIA/EA Regulations 2003 and provide evidence of Published Notices for the meeting duly signed minutes and attendance lists of least three consultation meetings.
4. You shall ensure that the ESIA study report is signed by all the ESIA team of experts.

You shall submit ten (10) copies of the EIA study report accompanied by the above specialized assessment reports upon payment of the applicable EIA processing and monitoring fees being 0.15% of the total project cost, a soft copy of the summarized ESMP in WORD format for preparation of public notice and one electronic copy of the report prepared by the team of experts to the Authority.

You are advised to comply accordingly.

REAGAN AWINO
FOR: DIRECTOR GENERAL

INVOICE

Bill To:

HAZE CONNECT LIMITED,
P.O. BOX 42550 – 80100 NAIROBI,
KENYA

Customer No : DSL_2717,
Invoice No: PSR_57650,
Posting Date: 1/22/2025 10:27:48 AM
E-citizen Tracking ID:PSR_57650

National Environment Management Authority(NEMA),
P.O BOX 67839 -0100,
Popo Road off Mombasa Road, Nairobi,
Phone: +(254)-020-6005522/6/7
Email: dgnema@nema.go.ke
Homepage: www.nema.go.ke
VAT Reg. No: P051149406X

No	Description	Unit Amount	Quantity	Amount (KES)
1	Project Submission report	10,000	1	10,000

eCitizen **Payment Mode**

Note: Use the following link to make payment through E - Citizen Platform

https://portal.nema.go.ke/_layouts/api/payment.aspx?tracking_id=PSR_57650

CURRICULUM VITAE – Dr. JOSEPH GEORGE TUNJE; JANUARY, 2024

BIO-DATA

Date of Birth: 22-08-1965
Marital Status: Widowed (with 4 children)
Profession: Teaching and Research
Name of Employer: Pwani University
Education Qualifications: Ph.D (Environmental Science)
Nationality: Kenyan
Postal address: Box 195-80108, Kilifi
Tel (Mob): +254 (0) 799467336 / 780256858
Email: g.tunje@pu.ac.ke

MEMBERSHIP IN PROFESSIONAL ASSOCIATIONS

- WIOMSA
- NEMA
- EIK

EDUCATION

- Ph.D (Environmental Science) – Pwani University
- M.Phil. (Environmental Studies) – Moi University
- B.Ed (Arts) Second Class Honors Upper Division - Kenyatta University

OTHER TRAININGS

- Certificate in Sustainable Agriculture Auditing, August 2014, Rainforest Alliance, Nairobi
- Socioeconomic Monitoring of Coastal and Marine Resources, September 2000, CORDIO, Mombasa Beach Hotel
- Certificate in Environmental Impact Assessment (EIA), School of Environmental Studies, Moi University, Eldoret (1999)

LANGUAGES & DEGREES OF PROFICIENCY

Language	Speaking	Reading	Writing
English	Good	Good	Good
Swahili	Excellent	Excellent	Excellent
Mijikenda	Excellent	Excellent	Excellent

A BRIEF PROFILE

Dr. Tunje is a lecturer in the Department of Environmental Science of Pwani University, Kilifi, and currently Chair of the Department. He has a Doctorate in Environmental Studies, and his research interest is in natural resource-use conflicts with a bias to marine fisheries. He has special interest in marine fisheries socioeconomics. He has researched and written papers on artisanal fisheries resource-use conflicts along the Kenyan coast. He is currently doing his latest

paper on “Using the DPSIR approach to assess fisheries resource-use conflicts along the Kenyan coast.”

Dr. Tunje has over 20 years professional experience in teaching both at secondary school and University levels, adult training on environmental issues, and mentoring coastal community groups in environmental conservation and management. Prior to joining the University, he worked as a research associate at CORDIO East Africa, where he was among the first Trainer of Trainees in Socio-economic monitoring of coastal and marine resources; a skill which made him train coastal and marine resource managers in Kenya, Tanzania and Rodriguez. Dr. Tunje is also affiliated to COMRED, an institution that works with coastal communities in Kenya in capacity building to solve their local problems using local solutions. In COMRED, he has managed to successfully lead 2 large projects; one funded by ReCoMaP and another by UNDP-SGP.

Some of his most recent works include socio-economic study of the Malindi-Ungwana Bay for the development of the Malindi-Ungwana Bay Co-management Plan; WWF Lamu consultancy on review of the status of fisheries co-management in coastal Kenya, focusing on the Lamu-Tana seascape, and development of 6 draft co-management plans for Pate Island BMUs as a socio-economic lead person. He was also a member of the Technical Woeking Group in the KEMFSED Project. Being a native of coastal Kenya, Dr. Tunje is fully conversant with coastal culture, attitudes and perceptions and these factors largely affect resource use patterns.

OTHER PROJECTS AND CONSULTANCIES UNDERTAKEN OVER THE LAST 10 YEARS

- ESIA Oyster Farming Project in Gazi, Msambweni, Kwale County. Proponent: Swahili Coast Farms Limited (2023) (Approved)
- ESIA for a number of development projects in Malindi under the MISHD Project. Propnent: Coast Development Authority (Approved).
- Participated in UNDP Accelerator Lab project in Tana River County aimed at collecting data to find a lasting solution to the water crisis (2023)
- ESIA for the proposed Milkfish Hatchery at Kwetu Training Centre, Mtwapa within Kilifi County (2023) (Approved)
- Coordination and Principle Investigator in a baseline survey of the mangrove forest in the Sabaki River Estuary Mangrove Conservation and Restoration Project in Malindi (2023).
- Coordination and development of joint Co-management Area (CMA) plans in the Shimoni-Vanga area for improved, integrated management of Kenya’s coastal and marine fisheries resources. Client: Kenya Marine and Fisheries Research Institute (2004).
- Development of Pate Island Beach Management Units (BMUs) Co-management plans: 5-year Management Plans to guide the development of Pate Island Fisheries Co-management areas. Client: TNC, Lamu (2003).
- EIA for the proposed dormitory at St. Thomas Girls’ School, Kilifi. Client: The Principal, St. Thomas Girls Secondary School (2003) (Approved).
- EIA for the proposed dormitory and class room block at Bahari Girls’ School, Kilifi. Client: The Principal, Bahari Girls Secondary School (2003).

- EIA project report for the proposed Barite Mining in Kavundzoni area in Ganze Sub-county, Kilifi County. Client: Barakali Drilling Muds Limited (2002)
- Together with others, development of Environmental and Social Management Framework (ESMF) for the Kenya Coastal development Project. Client: KCDP (2002)
- Mid-Term and end term evaluation of UNDP GEF SGP Wasini Marine Conservation Project. Client: Wasini Beach Management Unit (2000)
- Environmental Impact Assessment for the Proposed Charcoal Production Project in Magarini Sub-County, Kilifi County. Client: Magarini Charcoal Producers Association (2002)
- Training of Trainers (ToT) on Farming as a Business (FaaB); Client CISP, Malindi.
- Baseline Survey of UNDP GEF SGP Msambweni Marine Conservation Project. Client: COMRED (2002)
- ESIA Study of Jatropha farming Project in Malindi and Magarini Sub-Counties, Kilifi County; Client: CISP, Malindi (2002)
- Baseline survey on the status of the ecological, socio-economic and gender dimensions of communities living adjacent to mangrove ecosystems along Mtwapa, Kilifi and Mida creeks. Client: Kwetu Training Centre (2001)
- Environmental Impact Assessment for the proposed eco-charcoal production project in Rukinga Ranch. Proponent: Wildlife Works (2001)
- Promoting sustainable livelihood initiatives among poor coastal communities in Kilifi District, Kenya. Donor: European Union through ReCoMaP (2004)
- Project on ICZM Awareness to primary and secondary school teachers in Coast Province, Kenya. Client: ReCoMaP (2004)

EMPLOYMENT RECORD

April 2010 to date:	**Lecturer**, Department of Environmental Sciences, Pwani University
Key responsibilities:	Teaching, Research and Community work
Feb 2019 to date:	**Chairperson,** Department of Environmental Sciences, Pwani University
Key Responsibilities:	Overseeing the affairs of the Department that include coordination of teaching, research and community engagement
2016 – 2019:	**Examination Coordinator**, Department of Environmental Sciences
Key Responsibilities:	Overseeing issues of examination including ensuring the setting and administration of standard examinations, and processing of results.

Employer: Teachers Service Commission
Position: Teacher

From: 2003 to 2010
Employer: CORDIO East Africa
Position: Associate
From: 2003 to 2006
Employer: NIRP
Positions: Research Assistant
From: 1999 to 2002
Employer: Teachers service Commission
Position: Teacher
From: 1991-1997

RESEARCH GRANTS SECURED (Individual and Team)

1. World Bank Grant through KCDP: Development of a Joint Co-Management Area (JCMA) Plan in the Shimoni-Vanga area, south coast Kenya. Year 2016
2. TNC Grant: Development of Pate Island Beach Management Units (BMUs) Co-management plans. Year: 2015
3. NACOSTI Grant: Name of Project: Promoting Small Scale Mariculture Technologies along the Kilifi Creek. Year: 2011
4. NACOSTI Grant: Name of Project: Assessment of fisheries resource-use conflicts in the artisanal fisheries of the Vipingo-Mida Creek stretch, North coast Kenya *(Ph.D Project)*. Year: 2012
5. NACOSTI Grant: Name of Project: Impacts of Large scale mining and industrial developments in Kwale County. Year: 2014

COMMUNITY ENGAGEMENTS

1. Chair of the Pwani University Amidzi Welfare Group
2. Member of Technical Working Group to develop Co-Management Area guidelines in South coast Kenya.
3. Member Council of Church Elders, Kilifi Methodist Church, Coast Region Conference
4. Chair, Board of Management, Kambe Secondary School
5. Patron, Pwani University Environmental Club; Organization of/ and participation in environmental activities (Beach clean ups, Town clean ups and tree planting) woth other stakeholders

RESEARCH REPORTS & PUBLICATIONS

1. **Tunje, J.G;** Mirera, O.D; Kimani. J.G. & Maina, G.I. (2023): A baseline survey report of the Sabaki Estuary Mangrove Ecosystem. Griot Consulting Limited
2. Othoche, B; Mwakumanya, M; **Tunje, J;** Kiti, L (2020): Community Livelihoods and the Changing Weather Patterns: A Case for the Maize Crop Performance in the Lower AthiRiver Basin, Kenya. IOSR Journal of Humanities and Social Science (IOSR-JHSS) Volume 25, Issue 7, Series 3 (July. 2020) 45-52.
3. Othoche, B; Mwakumanya, M; **Tunje, J;** Kiti, L (2020): Predicting and Forecasting of Changes in Weather Patterns in the Coastal Lowlands along the Western Indian Ocean

Shoreline, Kenya. IOSR Journal of Humanities and Social Science (IOSR-JHSS) Volume 25, Issue 7, Series 4 (July. 2020) 17-31.

4. **Tunje, J.G** (in-progress): Using the D-P-S-I-R framework to assess artisanal fisheries resource-use conflicts along the Kenya coast**.**
5. **Tunje, J.G.,** Tole, M.P., Shauri, H.S; Hoorweg, J.C., & Munga, C.N. (2017): An assessment of fisheries resource use conflict management strategies among artisanal fishers of the Kenyan coast. International Journal of Fisheries and Aquatic Studies. Vol 5, Issue5.
6. **Tunje, J.G.,** Tole, M.P., Hoorweg, J.C., Shauri, H.S., & Munga, C.N. (2016): Conflicts in fisheries resource-use along the Vipingo-Mida Creek stretch of the Kenyan Coast: Causes and implications for fisheries management. International Journal of Fisheries and Aquatic Studies
7. Hoorweg, J.C & **Tunje, J.G.** (2003): Awareness of resource degradation among artisanal fishers in Kilifi and Lamu. Recent advances in coastal ecology: Studies from Kenya.
8. Mwaipopo, R; Fisher, E; Wanyonyi, I, N.; Kimani, P; **Tunje, J;** Msuya, F.E. & Bashemerewa, V (2011): The Relationship between Community-Based Organizations and the Effective Management of Coastal & Marine Resources in the WIO Region. WIOMSA Publication.

PAPERS AND POSTERS PRESENTED AT WORKSHOPS AND CONFERENCES

1. Shamsa, A; Tunje, J and Mwaura, J (2022): An evaluation of the socio-ecological impacts of fishing in the marine ecosystem: A case study of Mombasa Marine Protected area, Kenya. A Poster presented at the 12th WIOMSA Conference in Port Elizabeth, South Africa
2. Tunje J.G., Tole M.P., Shauri H.S., Hoorweg J.C., and Munga C.N (2017): "Using the D-P-S-I-R framework to assess artisanal fisheries resource-use conflicts along the Kenya coast" – Paper presented at the 10th WIOMSA Symposium in Dar es Salaam, 30th October to 4th November, 2017, Tanzania.
3. Tunje, J.G; Maina, A; Meinhold, K and Darr, (2018): Farmers' Baobab *(Adansonia Digitata L.)* Knowledge and Utilisation Practices in Kilifi and Kitui Counties of Kenya: Implications for Designing Information and Training Interventions – Poster presented at the "Global food security and food safety: The role of universities" in Tropentag, September 17-19, 2018, Ghent.

STUDENT SUPERVISIONS: MASTERS AND Ph.D

2017 to date:	Teresia Dzame Rimba: MSc. Thesis: Mycoremediation of organic market biowaste using milky *(Calocybe indica)* and oyster *(Pleurotus ostreatus)* mushroom in Kilifi **(Successfully defended)**
2018 to date:	Shamsa Hassan Ahmed: Evaluation of the ecological impacts of fishing: A case study of Mombasa Marine Protected area, Kenya **(Thesis Writing)**
2019 to date:	Bartha Othoche. PhD Thesis: Assessment of the impact of climate change on environmental health and community livelihoods in lower Tana and Athi river basins in Kenya **(Graduated)**
2019 to date	Wahida Bakari Bunu: MSc. Thesis: Evaluation of the composition and distribution of plant species within the mixed forest region of Arabuko Sokoke, Kenya **(Doing field work)**

2022 to date	Mildred Okoth: Assessent of heacy metals in seagrass, oysters, milkfish and barracuda fish of Kilfi creek **(Doing field data collection)**
2021to date	Rose Abae: Foraging and dispersal behaviour of the Tana River Red Colobus *(Piliocolobus Rufomitratus)* across forest fragments in natural and agro-ecosystems of the lower Tana River County, Kenya **(Thesis Writing)**

INTERNAL EXAMINAITON OF STUDENTS' PHD THESIS

1. Patrick Kimani Manguriu (2020): Economic Evaluation of the Small-Scale Marine Fisheries Using the Structure-Conduct-Performance Approach at Selected Landing site in Kenya

INTERNAL EXAMINAITON OF STUDENTS' MASTERS THESES

1. Jimmy Kahindi Yaa (2017): Abundance and Residence of bottlenose Dolphins (Tursiops Aduncus) inhabiting Malindi-Watamu Marine Protected Area – Kenya
2. Benard Ochieng (2018): Evaluation of Population status and foraging ecology of Sable antelope (*Hippotragus niger roosevelti* – Heller, 1910) in Shimba Hills National Reserve, Kenya.
3. Fatma Hassan Manyenze (2019): Characterization of Artisanal Fisheries Resources in the Lower Tana Delta and Estuary, North Coast Kenya.1. Agnes Kasyoka Wambua (2021): An Evaluation of the Effectiveness of Environmental Management Plan on Selected Quarries in Tezo Ward, Kilifi County, Kenya
4. Kakai Timothy Munyikana (2019):Assessing the effectiveness of light-emitting diodes for the reduction of sea turtle bycatch in an artisanal bottom set gillnet fishery – A case of Watamu, Ngomeni and Bwana Said Landing sites in northern coast of Kenya
5. Musembi Peter Mwanzia (2019): Assessment of fish and shellfish assemblage and exploitation in the seagrass meadows of Gazi Bay, Kenya
6. Shikami Kennedy Akweyu (2021): Impacts of Beach Seines on the Population Structure and Sustainability of Marbled Parrotfish, Leptoscarus Vaigiensis and Shoemaker Spinefoot, Siganus Sutor in Majoreni Fishing Area, South Coast Kenya
7. Sofia Kabibi Tumaini (2022): Status, Challenges, and Opportunities of the Cold Chain System in Kenya: The Case of the Fisheries Sector in Lamu and Mombasa Counties

EXTERNAL EXAMINAITON OF STUDENTS' MASTERS THESIS OF AFRICAN NAZARENE UNIVERSITY

1. Dominic Moi Obita (2022): Evaluation of factors influencing residents' environmental satisfaction of four housing development estates in Maralal Town, Samburu County, Kenya.
2. Hafsa Ahmed Mohamed (2022): Women empowerment and its contribution to sustainable land use management practices among farmers in Njoro Sub-county, Nakuru County, Kenya

REFEREES

Prof. Mwakio P. Tole	Prof. Mulewa Mwatete	Mr. Eric Gichana Kimori

Pwani University Tel: +254 (0) 733 812 799 P.O. Box 195-80108, Kilifi m.tole@pu.ac.ke	Pwani University Tel: +254 (0) 734 970 121 P.O. Box 195-80108, Kilifi Email: m.mwatete@pu.ac.ke	Griot Consulting Limited Tel: +254 (0) 0707 870 087 P.O. Box 298 – 80108, Kilifi Email: eric@griot.co.uk

CERTIFICATION

I, the undersigned, certify that, to the best of my knowledge and belief, this data correctly describes me, my qualifications and my experience.

Dated: January, 2024

Tel: +254 20 6005522/3/7, 6001945
Wireless: +254 20 210370
Mobile: 0724 253 398, 0733 600 035
Email: dgnema@nema.go.ke

Popo Road, Off Mombasa Road
P.O Box 67839-00200
Nairobi, Kenya
Website: www.nema.go.ke

NEMA/EIA/EL/30843 2025-02-26

JOSEPH TUNJE

P.O. BOX 195-80108 MOMBASA.

RE: ACKNOWLEDGEMENT OF EXPERTS LICENSE APPLICATION.

The National Environment Management Authority (NEMA) acknowledge receipt of your application for license as **Lead Expert** Environmental (Impact Assessment/ Audit) expert.

The application reference is **NEMA/EIA/EL/30843.** The Authority will review and communicate the record of decision in due course through the email address provided in the online system.

Annastacia Vyalu

HEAD OF EXPERT SECTION

EAE 23061268

FORM 7 (r.15(2))

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)

THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT

ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT (EIA/EA) PRACTICING LICENSE

License No : NEMA/EIA/ERPL/21621

Application Reference No: NEMA/EIA/EL/27902

M/S **JOSEPH TUNJE**
(individual or firm) of address
P.O. Box 195-80108 MOMBASA

is licensed to practice in the capacity of a (Lead Expert/Associate Expert/Firm of Experts) **Lead Expert**

General

registration number **1290**

in accordance with the provision of the Environmental Management and Coordination Act Cap 387.

Issued Date: **5/3/2024** Expiry Date: **12/31/2024**

Signature.....

(Seal)
Director General
The National Environment Management Authority

P.T.O.

ISO 9001 : 2015 Certified

PROPOSED CONSTRUCTION ON PLOT LR NO: 8852 NZAMBARAINI AREA MTWAPA SUB COUNTY KILIFI COUNTY

GRAND SUMMARY

ITEM	DESCRIPTION	PG No.	AMOUNT	TOTAL AMOUNT
1	**PRELIMINARIES**			
1.1	GENERAL & PARTICULAR PRELIMINARIES		582,680.00	**582,680.00**
2	**GROUND FLOOR**			
2.1	SUBSTRUCTURE		962,490.00	
2.2	RC SUPERSTRUCTURE		906,355.00	
2.3	WALLING		29,405.00	
2.4	FINISHES		226,00.00	**1,898,250.00**
3	**TYPICAL FLOORS**			
3.1	RC SUPERSTRUCTURE		1,270,140.00	
3.2	WALLING		679,380.00	
3.3	WINDOWS		396,095.00	
3.4	DOORS		870,335.00	
3.5	EXTERNAL FINISHES		563,320.00	
3.6	INTERNAL FINISHES		841,450.00	**4,620,720.00**
4	**PRIME COST & PROVISIONAL SUMS**			
4.1	ELECTRICAL INSTALLATION		559,010.00	
4.2	MECHANICAL INSTALLATION		783,275.00	
4.3	JOINERY FITTINGS		975,330.00	
4.4	EXTERNAL WORKS (MINIMAL)		78,265.00	
4.5	CONTINGENCIES		503,280.00	**2,899,160.00**
	TOTAL AMOUNT CARRIED TO FORM OF TENDER			**10,000,810.00**

AMOUNT IN WORDS:

KENYA SHILLINGS: …Ten million, Eight Hundred Ten Shillings Only…

……

……..

Signature:  Date: 04/03/2025

Witness:  Date: 04/03/2025

Stamp/Seal

QS. RONO G. FREDRICK
Registered Quantity Surveyor (Q 831)
04 MAR 2025
P.O Box 38249 - 00100, NAIROBI
Mobile No.: 0725 315 338
Email: ronofredie@gmail.com

NOTE: FOR THE PURPOSE OF THIS APPLICATION ONLY-QS. RONO GEOFFREY FREDRICK (Q831).NOT TO BE USED ELSEWHERE WITHOUT THE AUTHORITY OF THE UNDERSIGNED.

11/07/2023

11/07/2023

APPROVED

APPROVED

PRACTISING CERTIFICATE FOR QUANTITY SURVEYORS

Pursuant to the Architects & Quantity Surveyors Act Cap 525

QS. RONO GEOFFREY FREDRICK (Q831)

is duly qualified as a Quantity Surveyor and is entitled to practice as such Quantity Surveyor

From **1st July 2024** *to* **30th June 2025**

Registrar

Date **10th September 2024**

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APPROVED

APPROVED

11/07/2023

11/07/2023

Cert. No.: **PCQS/634/24**

Annual Membership Certificate

We hereby certify that ***Geoffrey Fredrick Rono*** Membership No. ***687***
Is a ***Professional Member*** of the Institute of Quantity Surveyors of Kenya in good standing.
This certificate is valid for the period ***1st Jan 2025*** to ***31st Dec 2025***
Issued this ***3rd*** day of ***March 2025***

Under the seal of the Council

PRESIDENT

HON. SECRETARY

HON. REGISTRAR

INSTITUTE OF QUANTITY SURVEYORS OF KENYA

CERTIFICATE OF MEMBERSHIP

This is to certify that

Geoffrey F. Rono

was elected a

Graduate Member

of the Institute of Quantity Surveyors of Kenya

On 20th March, 2013

Chairman

.....

Hon. Secretary

.....

Hon. Registrar

.....

Membership No.

Q 687

Issued under rules and regulations governing the Institute of Quantity Surveyors of Kenya Constitution.